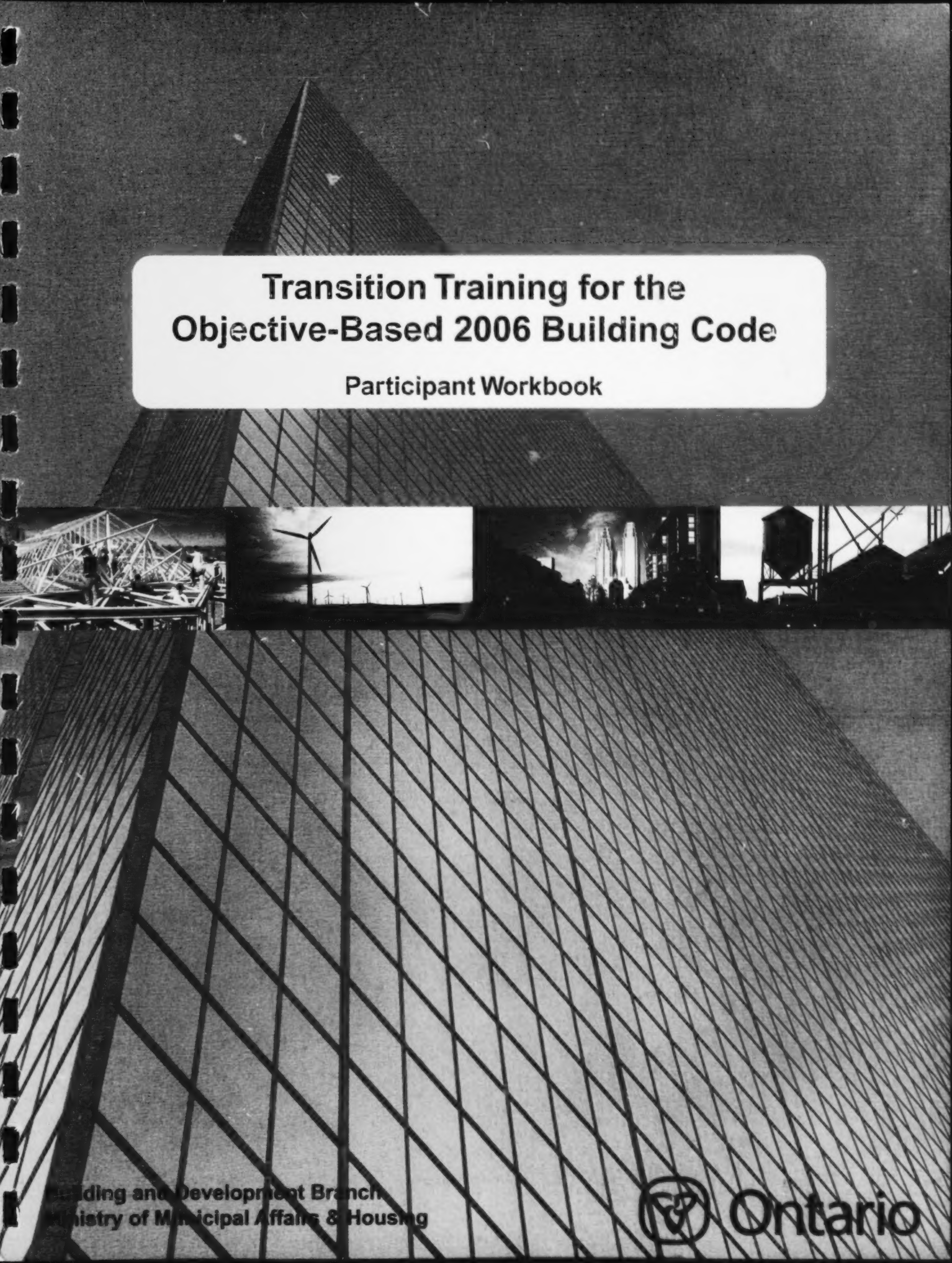

Transition Training for the Objective-Based 2006 Building Code

Participant Workbook

Building and Development Branch
Ministry of Municipal Affairs & Housing

Ontario

Ontario

Transition Training for the Objective-Based 2006 Building Code

Participant's Workbook

Building and Development Branch
Ministry of Municipal Affairs & Housing

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Module 1

Introduction to the Course

Course Overview

This course will provide an introduction to the 2006 Building Code including its new organization, additional information and a sample assessment process for *alternative solutions*. You will be given opportunities to practice and apply your new knowledge through exercises and case studies.

This course has been developed for Chief Building Officials, Inspectors, Registered Code Agencies, Persons authorized by Registered Code Agencies and Designers who are familiar with the 1997 Code and who have experience in reading, applying and enforcing the 1997 Code. This course will assist you in the ***transition*** to the *objective*-based format of the 2006 Code. Technical changes from the 1997 to the 2006 Code are not covered in the course.

Learning Outcomes

At the end of Day 1, you will be able to:

- Find familiar content in the reorganized 2006 Building Code
- Identify and locate key features of the first edition of Ontario's *Objective*-Based Code
- Apply the 2006 Building Code using Division B provisions (*acceptable solutions*)

At the end of Day 2, you will be able to:

- Describe the purpose and use of *objectives* and *functional statements*
- Describe the steps in the sample procedure to evaluate *alternative solutions*
- Apply the 2006 Building Code to proposed *alternative solutions*
- Identify the prescribed documentation for the submission and evaluation of *alternative solutions*
- Describe the benefits of *Objective*-Based Codes

A Brief Introduction to *Objective*-Based Codes

Facilitator / Participant / Self-Study Note: Refer to the Glossary to look up definitions of new terms, which will be repeatedly covered throughout the course.

An *objective*-based code includes *objectives* or goals that the Code is meant to achieve. This is different from the 1997 Code since the *objectives* or goals were not previously stated in the Code.

An *Objective*-Based Code is a code in which every technical requirement achieves one or more of the *objectives* (e.g. Safety, Health, Accessibility, Fire, Structural, Water & Sewage Protection of Buildings, Water & Sewage Protection, Resource Conservation, Conservation of Buildings and Environmental Integrity

The *objective*-based code contains most of the 1997 Code provisions as well as new provisions. Complying with these provisions is one option for compliance since these provisions meet one or more of the Code's stated *objectives*.

In the 1997 Code, equivalencies were an option to achieve compliance. Equivalencies had to meet the level of performance level of the provisions of the Code. In the 2006 Code, equivalencies are called *alternative solutions* and must meet the level of performance of the applicable *acceptable solutions* (provisions of requirements) of Division B.

Note that the words "requirement" and "provision" have the same meaning in this course.

Course Materials

For this course you require:

- 2006 Building Code Compendium (Volumes 1 & 2)
- Participant Workbook

Optional materials:

- 1997 Ontario Building Code (hard copy)

The Building Code documents may be purchased:

In person from

Publications Ontario
880 Bay St., 1st Floor
Toronto, ON M7A 1N8

By Telephone: 416-326-5300

Tool Free in Ontario: 1-800-668-9938

By Fax: 416-325-3407

By mail: Publications Ontario, 50 Grosvenor Street, Toronto, Ontario, M7A 1N8

In Ottawa in person from

Service Ontario (part of Ottawa City Hall, on ground floor)
Government Service Centre
110 Laurier Avenue West, Level 1
Ottawa, ON K1P 1J1

By Telephone: 613-238-3630

Toll Free from 613 Area Code: 1-800-268-8758

By Fax: 613-566-2234

By mail: Service Ontario, Government Service Centre
110 Laurier Avenue West, Ottawa, Ontario, K1P 1J1

Online: www.publications.gov.on.ca

Download from E-Laws: http://www.e-laws.gov.on.ca
(Regulation only available on E-Laws)

Introduction of the Group

Instructor/Facilitator:______________________________

____

____

Introduce yourself and include your name, title, and place of work.

Other people taking the course:

____

____

____

____

____

____

____

Course Outline

Day 1

Module 1	Introduction to the Course
Module 2	Organization of the 2006 Code
Module 3	Applying the Code Using Division B
Module 4	History of *Objective*-Based Codes
Module 5	Introduction to *Alternative solutions*
Module 6	Assessing Method of Compliance, Case Studies

Day 2

Module 7	*Alternative Solutions*
Module 8	*Objectives* and *Functional statements*
Module 9	Level of Performance
Module 10	Conditions of Acceptance and Document Retention
Module 11	Guided Case Studies
Module 12	Case Studies

Each module will generally have the following format:

- Introduction
- Learning Outcomes
- Course Material
- Exercises
- Case Study (if applicable)
- Summary
- Review

This course emphasizes "learning by doing" through exercises and case studies. Your participation, support from the facilitator or instructor and the experiences of your fellow students are the primary resources of this course.

This course was developed under the direction of Ontario's Ministry of Municipal Affairs and Housing, other provincial and territorial ministries responsible for building, plumbing and fire regulations, and the Canadian Codes Centre of the National Research Council.

Closing Comments

At the end of the course you should be able to apply the 2006 Building Code in your work. Please ask questions and participate to get the most benefit from the course.

There are 3 different types of codes;

1. Prescriptive Type Codes

   The 1997 and 2006 Codes contain prescriptive provisions. e.g. Sentence 3.3.1.9.(1) from the 1997 Building Code and Division B, Sentence 3.3.1.9.(1) from the 2006 Code, "The minimum width of a public corridor shall be 1 100 mm."

2. *Objective*-Based Codes

   Ontario's 2006 Building Code is objective-based. The *objectives* of the requirements of Division B are listed in Supplementary Standard SA-1.

3. Performance-Based Codes.

   The 1997 and 2006 Codes contain performance provisions. e.g. Sentence 3.2.5.7.(1) from the 1997 Building Code and Division B, Sentence 3.2.5.7.(1) from the 2006 Code, "An adequate water supply for fire fighting shall be provided for every building."

Post-Course Examination

The course will be followed by an open-book examination of the multiple-choice type. You will be permitted to use your Ontario 2006 Building Code Compendium. You will not be allowed to use neither your participant manual nor the flow chart "Applying the 2006 Code". You will answer directly on your test-paper by circling your choice of answer from the a) to e) choices.

END OF MODULE 1

Module 2

Organization of the 2006 Code Compendium

Introduction

This module explores the organization of the 2006 Building Code Compendium and is fundamental for learning new information in later modules. You are encouraged to open the 2006 Code and explore the new organization as it is introduced. The purpose of this module is to find familiar 1997 Code provisions that have been moved, and to find where new information is located. All the new terms will be explained in later modules.

Learning Outcomes

At the end of this module, you will be able to:

- Describe the organization of the 2006 Building Code
- Describe the general content of each Division
- Describe how to reference provisions
- Locate the following:
  - *Objectives*
  - *Functional statements*
  - *Acceptable solutions*

Organization of the 2006 Building Code Compendium

Using the Table of Contents in the 2006 Code Compendium, familiarize yourself with the three Divisions in Volume 1.

The 2006 Building Code is organized into three Divisions: Division A, Division B, and Division C.

Division A Compliance and Application Provisions, *Objectives* and *Functional Statements*

Division A primarily contains information that is new to the 2006 Code. It states:

- how to comply with the Code,
- the scope of each Division and the application of the Parts of Division B to buildings, and
- the *objectives* and *functional statements* of the Code

Division B ***Acceptable solutions***

Division B is essentially Parts 3 to 11 of the 1997 Code plus new Part 12, the technical provisions of the Code.

Division C **Administrative Provisions**

Division C contains administrative provisions, such as buildings that require professional design and review, information on *alternative solutions*, disputes, rulings and interpretations, qualifications of practitioners, and rules on the transition, revocation and commencement of the Building Code.

The hard copy of the 2006 Building Code Compendium is published in the following volumes:

Volume I	Division A, Division B, Division C
Volume II	Appendix A and B and the Supplementary Standards

Code Provisions Numbering System

The Code provisions Numbering System is as follows:

Division B	
3.	Part
3.6.	Section
3.6.2.	Subsection
3.6.2.3.	Article
3.6.2.3.(1)	Sentence
3.6.2.3.(1)(f)	Clause
3.6.2.3.(1)(f)(i)	Subclause
3.6.2.3.(1)(f)(i)(A)	Sub-subclause
12.3.4.5.(6).1.	Paragraph

The new organization into Divisions will not change this naming convention **within** the Divisions. **However, it will be necessary to specify the division reference.**

For the purposes of this manual, Code users should add the word "Division," or the short form "Div." and the Division alphabetical designation in front of a Code reference. For clarity, Code provisions should be written as follows:

- ✓ Division B, Sentence 3.6.2.1.(1),
- ✓ Div. B, Sentence 3.6.2.1.(1), or
- ✓ Div. B, 3.6.2.1.(1)

Use "Division" or "Div." when referencing provisions or appendix notes in the 2006 Building Code.

Appendix notes references should be written as follows:

- ✓ Div. B, A-3.6.2.1.(1), or
- ✓ Div. B, Appendix A-3.6.2.1.(1)

Appendix A is organized under the following three headings:

1. Explanatory Material for Division A
2. Explanatory Material for Division B
3. Explanatory Material for Division C

Internal Cross-References

Div. A, Sentence 1.1.1.4.(1) states: "*If a provision of this Code contains a reference to another provision of this Code but no Division is specified, both provisions are in the same Division of this Code.*"

In other words, if a Division is not specified, the reference is in the same Division. For example, Div. B, Sentence 3.4.6.9.(6) states: "*If a horizontal exit utilizes bridges between buildings or outside balconies, the bridges or balconies shall conform to Article 3.2.3.19.*"

The Division is not specified for Article 3.2.3.19., which means that this Article is in the same Division as Sentence 3.4.6.9.(6) – i.e. in Division B.

The same convention applies to the Appendix references. That is, within Division B, "*See Appendix A*" refers to the Explanatory Material for Division B in Appendix A.

Referencing Across Divisions

In cases where a provision to another Division is referenced in the Code, the name of the Division is specified after the Code reference. For example, Div. B, Sentence 9.1.1.1. (1) states: "*The scope of this Part shall be as described in* ***Subsection 1.1.2. of Division A.***".

STOP

Change From the 1997 Code

The 1997 Code was organized into 12 Parts: Part 1, Part 2, Part 3, etc…

Administrative provisions were mostly located in Parts 1, 2 and 12, and technical provisions were located in Parts 3 to 11.

Most of the content of the 1997 Code is maintained in the 2006 Code in a reorganized structure. As you can see, the administrative provisions from Parts 1 and 2 were transferred in part to Division A, B, C and the Supplementary Standards.

Figure 2-1 on the next page illustrates the changes in organization between the 2006 Code and the 1997 Code.

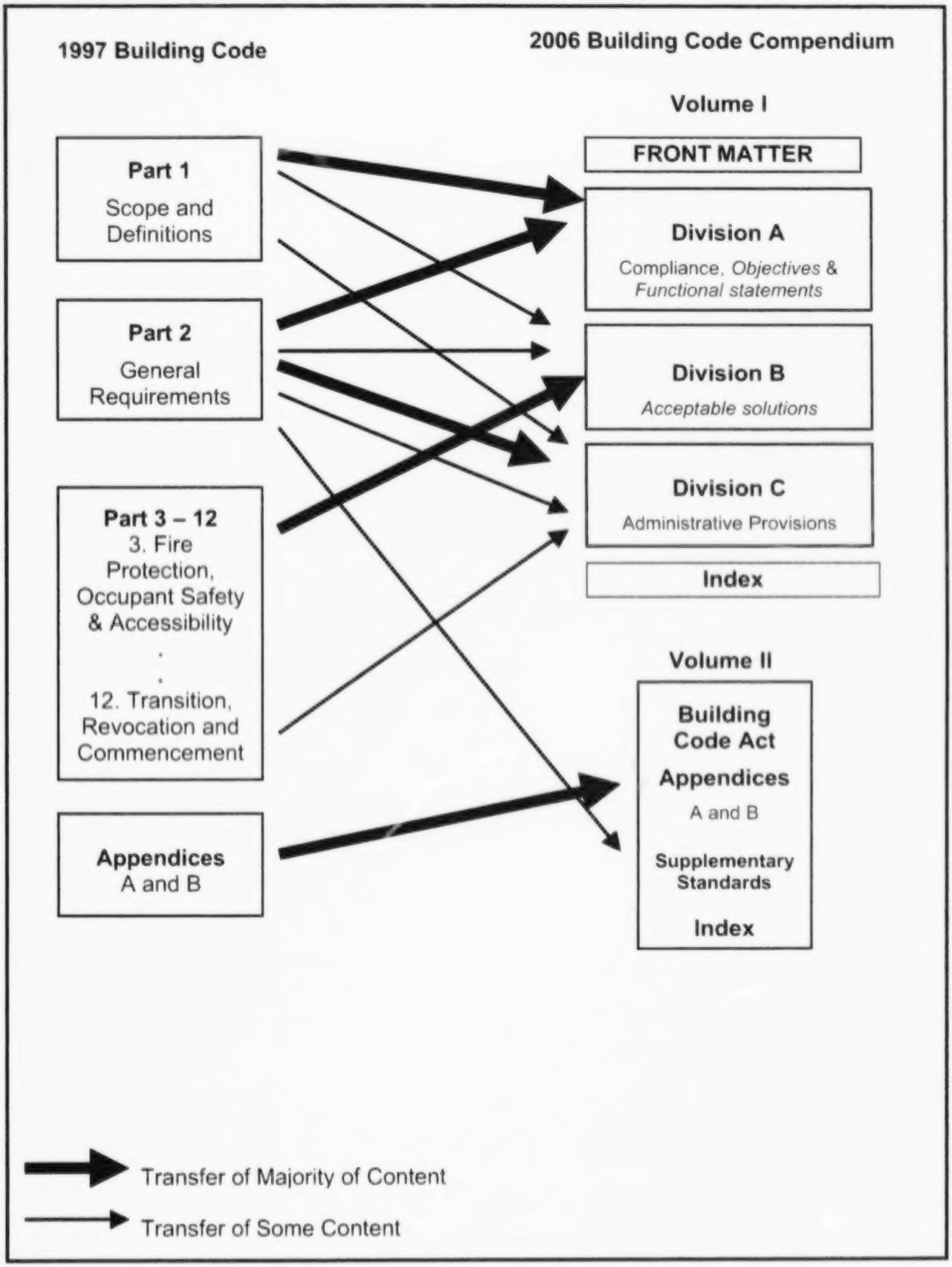
Organization of the 2006 Code

The compendium edition of Ontario's 2006 objective-based Building Code comes in two volumes.

Volume I includes a preface, highlights of major changes and the Code amendment history which we will call "front matter". Volume I also contains Divisions A, B and C and an index.

Volume II contains the *Building Code Act*, Appendices A and B, the Supplementary Standards and an index.

The front matter of Volume I at pages xv to xvii contain a Table of Concordance which tells you where the Administrative Provisions of the 1997 Code were relocated to in the 2006 Code.


1997 Building Code
2006 Building Code Compendium
Volume I
Part 1
Scope and Definitions
FRONT MATTER
Division A
Compliance, Objectives & Functional statements
Part 2
General Requirements
Division B
Acceptable solutions
Division C
Administrative Provisions
Part 3 – 12
3. Fire Protection, Occupant Safety & Accessibility
.
.
12. Transition, Revocation and Commencement
Index
Volume II
Building Code Act
Appendices
A and B
Supplementary Standards
Index
Appendices
A and B
Transfer of Majority of Content
Transfer of Some Content

]

You are likely most familiar with the technical provisions of the 1997 Code. For this reason we will start looking at Division B. Then we will examine Divisions A and C.

Division B

Division B is titled **"*Acceptable solutions.*"** This is a new term for the technical provisions in Division B. "*Acceptable solutions*" is used interchangeably with "Division B provisions" as they have the same meaning.

An *acceptable solution* is a provision or set of provisions in Division B.

Therefore, Division B includes all technical requirements including the technical changes that are often included with the release of new Code editions. The technical changes are not covered in this course.

Part 1 of Division B contains some **general provisions** from Parts 1 and 2 of the 1997 Code. For example, the Table of referenced documents is in Division B, Section 1.3. The rest of the administrative provisions formerly located in Part 1 of the 1997 Code were moved to Divisions A and C of the 2006 Code.

Part 2 of Division B is **Reserved**. The provisions of Part 2 of the 1997 Code were moved into pieces to Divisions A, B and C and the Supplementary Standards. Rather than renumber the other provisions of Division B, Part 2 was left blank in the 2006 Code and is reserved for future use.

Parts 3 to 12 of Division B are **similar to the technical provisions of Parts 3 to 11 of the 1997 Code**, as you can see in the Table of Contents of Division B.

Division B contains Parts 3 through 11 from the 1997 Code. Part 1 of Division B also contains some general provisions from Parts 1 and 2 of the 1997 Code. Part 2 of Division B is Reserved.

New tables titled "*Objectives* and *Functional Statements* Attributed to the applicable *Acceptable Solutions* in Parts of Division B" are located in Supplementary Standard SA-1.

These ***attribution tables*** identify the *objectives* and *functional statements* linked to the provisions in Division B. These terms and their meanings will be discussed in Module 7.

Attribution Tables are included in Supplementary Standard SA-1.

STOP

Exercise 2-1 (Guided)

Using the 2006 Code, find the provisions for wood-frame construction that were previously found in Section 9.23.

Process to arrive at the answer:

- Division B is applicable since these are technical provisions.
- The Part and Section numbering generally stay the same in Parts 3 to 12 of the 2006 Code.

Answer:

- Div. A, Article 1.1.2.4. → Division B, Section 9.23.

Exercise 2-2

Using the Table of Concordance for the Administrative Requirements and the index for the technical provisions, find the following provisions of the 1997 Code in the 2006 Code.

1. Construction requirements for Part 3 buildings based on size and occupancy (Subsection 3.2.2. in the 1997 Code)

   ____

2. Ventilation and fire protection systems for commercial cooking equipment (Article 6.2.2.6. in the 1997 Code)

   ____

3. Table of referenced documents and applicable editions (Table 2.6.3.2. in the 1997 Code)

4. List of defined terms (Article 1.1.3.2. in the 1997 Code)

5. Generally speaking, if the prescriptive provisions for guards and handrails were amended, in which Division and Parts would you find the changed provisions?

Division C

Division C contains administrative provisions that were formerly found in Parts 1 and 2 of the 1997 Code as well as the provisions for the transition, revocation and commencement of the Building Code.
Provisions in Division C include:

- Requirements for the design and review of work by an architect, professional engineer or both;
- Notices and Inspections
- Period within which a permit is to be Issued or Refused; and
- Qualifications for Building Code practitioners.

Exercise 2-3 (Guided)

Using the Table of Concordance, find the provisions of Section 2.3., *Design and General Review* of the 1997 Code in the 2006 Code.

Process to arrive at the answer:

- This provision will not be in Division B since it is not a technical provision.
- Division A, Sentence 1.1.1.3.(1), Scope of Division C, informs us that Division C is applicable since this is an administrative provision.

Answer:

- From Table of Concordance, Division C, Subsection 1.2.1.

Exercise 2-4

Using the Table of Concordance, find the following provisions of the 1997 Code in the 2006 Code.

1. Conformance with administrative requirements (Article 1.1.1.1. in the 1997 Code)

   ____

2. Information and Warrant Forms (Article 2.9.1.1. in the 1997 Code)

   ____

3. Qualifications for Chief Building Officials and Inspectors (Section 2.16. in the 1997 Code)

   ____

Division A

Division A contains most of the material unique to the new *Objective*-Based Code, as well as some scope and application provisions previously found in Parts 1 and 2 of the 1997 Code.

There are three key features of Division A indicated by the titles of the three Parts:

Part 1	Compliance and General
Part 2	*Objectives*
Part 3	*Functional statements*

Division A contains compliance and application provisions, *objectives* and *functional statements*.

Division A, Part 1 Compliance describes **how to achieve compliance** with the Code. Although the wording of the compliance Article has changed from the 1997 Code, it clarifies the same two compliance options offered in the 1997 Code:

1. **Comply with the code requirements** (i.e., comply with applicable ***acceptable solutions*** of Division B in the 2006 Code), or

2. **Comply by using an *alternative solution*** (called an equivalent in the 1997 Code) that will **achieve** at least the **level of performance required by the applicable Code** requirement of Division B.

Compliance Methods in the 2006 Code

- **Comply with Division B provisions [Div. A, 1.2.1.1.(1)(a)]**
- **Comply using *alternative solution*(s) [Div. A, 1.2.1.1.(1)(b)]**

***Alternative solution* is the new term for an equivalency or an equivalent.**

Div. A, Article 1.2.1.1. *Compliance With Division B*, restates the same compliance options that were in the 1997 Code, but with an improved framework for evaluation of *alternative solutions* (equivalents). *Alternative solutions* will be examined in greater detail in Modules 7 to 14.

Part 1 of Division A also contains provisions relating to scope and application of the Code, which were previously found in Parts 1 and 2 of the 1997 Code. For example, Subsection 1.1.1. of Division A provides the Scope of Application of Divisions A, B and C and the Articles of Subsection 1.1.2. of Division A describes the application of Parts 1 to 12 of Division B.

Division A, Part 2, *Objectives* contains the list of ***objectives*** of the Code. The *objectives* describe the **overall goals** that the Code's provisions are intended to achieve.

***Objectives* state what the Code aims to achieve.**

The 2006 Building Code has 7 categories of *objectives*:

OS	**Safety**
OH	**Health**
OA	**Accessibility**
OP	**Fire, Structural, Water and Sewage Protection of Buildings**
OR	**Resource Conservation**
OE	**Environmental Integrity**
OC	**Conservation of Buildings**

The *objectives* are a key component of the *Objective*-Based Code and their content and language will be examined in Modules 7 and 10.

Division A, Part 3, *Functional Statements* contains the list of ***functional statements*** in Div. A, Table 3.2.1.1. For example:

F01 To minimize the risk of accidental ignition.

***Functional statements* are the functions the building or its elements must be capable of performing.**

Functional statements are used together with the *objectives* in the evaluation of *alternative solutions*. This process will be described in Modules 7 and 10.

STOP

Exercise 2-5 (Guided)

Using the Table of Concordance, find the list of defined terms that was previously found in Article 1.1.3.2. of the 1997 Building Code in the 2006 Building Code.

Process to arrive at the answer:

- This provision will not be in Division B since it is not a technical provision, although Division B contains a reference to Division A for defined terms. Also, this provision will unlikely be in Division C since it is not an administrative provision.

Answer:

- From the Table of Concordance, Division A, Clause 1.4.1.2.(1)(b) contains the list of defined terms.

Exercise 2-6

Using the 2006 Code and the Table of Concordance or the Table of Contents of Division A, find the following provisions.

1. What Division and Part contains the list of *functional statements*?

   ____

2. What *functional statement* does F04 refer to?

   ____

3. What Division and Part contains the list of *objectives*?

   ____

4. To what does the *objective* does OH refer to?

   ____

5. What Section in Division A deals with referenced documents? (Section 2.6. in the 1997 Code)

   ____

6. What Article describes buildings that fall under Part 9 of Division B? (Article 2.1.1.3. in the 1997 Code)

   ____

7. What Article states that a farm building shall conform to the National Farm Building Code? (Article 2.1.1..5. in the 1997 Code)

   ____

8. Which edition of the National Farm Building Code is referenced in the 2006 Building Code?

   ____

Appendices

Just like the 1997 Code, the 2006 Code has two Appendices which are located in Volume II. Appendix A contains additional explanatory information to assist Code users in understanding the intent of the referenced provisions of Divisions A, B and C. Appendix B contains Imperial conversion factors for metric values used in the Code and the multiples of the Metric units.

Appendix A contains explanatory information on the provisions of Divisions A, B and C that are referenced. Appendix B contains Imperial conversion factors of Metric values and the multiples of Metric units.

Exercise 2-7

Using the 2006 Code, find and write the Code reference for the following explanatory notes in Appendix A.

The purpose of this exercise is to become familiar with the location of the explanatory notes in Appendix A and the way to reference them.

1. Appendix A Explanatory Note for Division A, Clause 1.2.1.1.(1)(a)

   Reference: ______________________________

2. Appendix A Explanatory Note for Division C, Sentence 1.2.1.1.(3)

   Reference: ______________________________

3. Appendix A Explanatory Note for Division B, Sentence 9.9.8.4.(1)

   Reference: ______________________________

Supplementary Standards

The Supplementary Standards in the 2006 Code supersede the Supplementary Guidelines referenced in the 1997 Code. The Supplementary Standards with the SA prefix are referenced by Division A, those with the SB prefix are referenced by Division B and those with the SC prefix are referenced by Division C of the Building Code. e.g., Division B, Sentence 9.10.3.1.(1), "*Fire-Resistance and Fire-Protection Ratings*" references Supplementary Standard SB-2, "Fire Performance Ratings".

Index

The index is located at the end of Volume I and Volume II.

Items contained in the Index are referenced to the numbering system used in the Code instead of to page numbers. Unless otherwise noted, all the code references in the Index are to provisions in Division B. Provisions in other divisions are indicated by a capital letter in brackets. For example, symbols and abbreviations are in Division A, Article 1.4.2.1. In the index, it is shown as 1.4.2.1.[A].

The index contains no references to Appendix notes.

STOP

New Location of Selected Familiar Provisions from 1997 Code

1997 Code	2006 Code
Part 1	
1.1.1.1. Conformance with Administrative Requirements	Div. C, 1.1.1.1. Conformance with Administrative Requirements
1.1.3.2. Defined Terms	Div. A, 1.4.1.2. Defined Terms
Part 2	
2.1. Application (of Parts 1 to 11)	Div. A, 1.1.1. Application of Division B
2.1.1.5. Farm Buildings	Div. A, 1.3.1.2. Farm Buildings
2.1.3. Building Size Determination	Div. A, 1.1.3. Building Size Determination
2.2.2. BMEC Application Fees	Div C, 2.3.1.1.(1) BMEC Application Fees
2.3. Design and General Review	Div. C, 1.2. Design and General Review
Table 2.6.3.2. Referenced Documents	Div. B, Table 1.3.1.2. Referenced Documents
2.16. Qualifications for Chief Building Officials and Inspectors	Div. C, 3.1. Qualifications for Chief Building Officials and Inspectors
Parts 3 to 11	**Division B, Parts 3 to 12**
Part 12	Division C, Part 4

Summary

The key points in this module on the organization of the 2006 Code are:

1. The 2006 Code is organized into three Divisions: ***Division A, Division B, and Division C***.

2. Use "Division" or "Div." when referencing provisions or appendix notes in the 2006 Code.

3. An ***acceptable solution*** is a provision or set of provisions in Division B.

4. ***Division B*** contains Parts 3 through 11 from the 1997 Code. Part 1 of Division B also contains some general provisions from Parts 1 and 2 of the 1997 Code. Part 2 of Division B is Reserved.

5. Attribution Tables are included in Supplementary Standard SA-1.

6. ***Division C*** contains administrative provisions.

7. ***Division A*** contains compliance methods, *objectives* and *functional statements*.

8. ***Compliance*** Methods in the 2006 Code

   - Comply with Division B provisions [Div. A, 1.2.1.1.(1)(a)], or

   - Comply using *alternative solution*(s) [Div. A, 1.2.1.1.(1)(b)]

9. ***Alternative solution*** is the new term for an equivalency or an equivalent.

10. ***Objectives*** state what the Code aims to achieve. The 2006 Building Code has 7 categories of *objectives*:
    - Safety (OS)
    - Health (OH)
    - Accessibility (OA)
    - Fire, Structural, Water and Sewage Protection of Buildings (OP)
    - Resource Conservation (OR)
    - Environmental Integrity (OE)
    - Conservation of Buildings (OC)

11. ***Functional statements*** are the functions that the buildings or its elements must be capable of performing.
12. Appendix A and B are located in Volume II.

Review

As a result of this module, I am able to:

- ☐ Describe the organization of the 2006 Code
- ☐ Describe the general content of each Division
- ☐ Describe how to reference provisions
- ☐ Locate the following:
    - ☐ *Objectives*
    - ☐ *Functional statements*
    - ☐ *Acceptable solutions*

Where Do We Go From Here?

The next module will build on this overview of the organization of the 2006 Code with exercises in applying the 2006 Code to a typical design.

END OF MODULE 2

Module 3

Applying the Code Using Division B

Introduction

This module demonstrates that the process of applying the 2006 Code to a typical design using Division B provisions - *acceptable solutions* - is very similar to the process of applying the 1997 Code.

Learning Outcomes

At the end of this module, you will be able to:
- Describe the steps to apply the 2006 Code, Div. B
- Apply the 2006 Code to a typical design

Applying the 1997 Code

In the typical application of the 1997 Code, there is a process that is used to determine:
- whether the Code is applicable,
- which Parts of the Code apply, and
- what requirements are applicable to the proposed design.

Although you may not go through each step of this process in your daily work, the process is applicable to most building designs, permit applications and inspections.

The Building Code Act and the Code contain all the information to direct this process. We will start by thinking of the process to apply the 1997 Code.

Exercise 3-1

Plans are submitted with a building permit application for a new 4-storey apartment building. Prior to reviewing compliance with the technical requirements (such as construction, exits, fire separations, etc.), there are some steps to get to the technical requirements.

The purpose of this exercise is to start thinking about the steps you take (maybe unconsciously) to apply the technical requirements of the Code.

What steps would you follow under the 1997 Code before you start the plans review to confirm compliance with technical requirements? (Hint: Imagine teaching a new plans examiner.)

First: ____

Next: ______________________________

Next: ______________________________

Next: ______________________________

Applying the 2006 Code

The process of applying the 2006 Code is very similar to the process for the 1997 Code.

You will likely apply the 2006 Code using Division B most of the time.

Each Division B technical requirement helps satisfy at least one *objective* of the Code. Therefore, it is not necessary to consult the *objectives* in Division A when applying Division B.

Flow Chart to Apply the 2006 Code

The flow chart on the next page summarizes the necessary steps to apply the 2006 Code. We will only look at the centre and left side steps for now (Division B provisions).

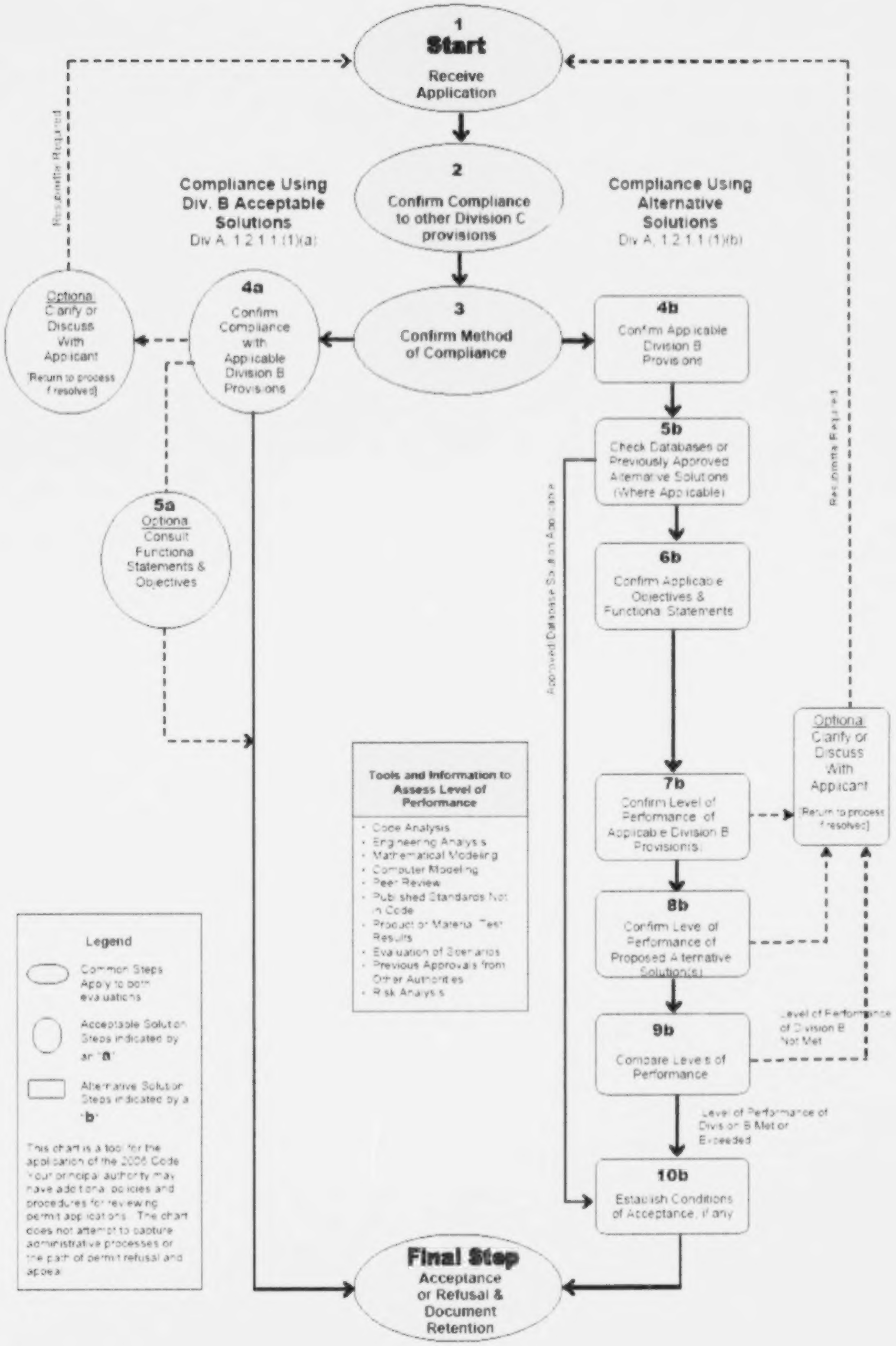
The flow chart also shows the process for evaluating *alternative solutions* on the right side of the page. These steps are marked with the letter "b" and will be examined in Modules 9 to 12.

> The purpose of the flow chart is to assist you in understanding and applying the 2006 Code for permit processing. These steps are not written in the Code. Your principal authority may have additional steps and different procedures for reviewing permit applications. The flow chart does not attempt to capture administrative and appeal processes.

You may wish to remove the flow chart from the workbook for reference throughout the course.

A larger scale Flow Chart is included in Appendix 6.

Applying the 2006 Code


1
Start
Receive Application
2
Confirm Compliance to other Division C provisions
3
Confirm Method of Compliance
Compliance Using Div. B Acceptable Solutions
Div A, 1.2.1.1.(1)(a)
Compliance Using Alternative Solutions
Div A, 1.2.1.1.(1)(b)
Resubmittal Required
Optional
Clarify or Discuss With Applicant
(Return to process if resolved)
4a
Confirm Compliance with Applicable Division B Provisions
5a
Optional
Consult Functional Statements & Objectives
4b
Confirm Applicable Division B Provisions
5b
Check Databases or Previously Approved Alternative Solutions (Where Applicable)
Approved Database Solution Applicable
6b
Confirm Applicable Objectives & Functional Statements
7b
Confirm Level of Performance of Applicable Division B Provisions
8b
Confirm Level of Performance of Proposed Alternative Solution(s)
9b
Compare Levels of Performance
Level of Performance of Division B Not Met
Level of Performance of Division B Met or Exceeded
10b
Establish Conditions of Acceptance, if any
Final Step
Acceptance or Refusal & Document Retention
Legend
Common Steps Apply to both evaluations
Acceptable Solution Steps indicated by an "a"
Alternative Solution Steps indicated by a "b"

Tools and Information to Assess Level of Performance

- Code Analysis
- Engineering Analysis
- Mathematical Modeling
- Computer Modeling
- Peer Review
- Published Standards Not in Code
- Product or Material Test Results
- Evaluation of Scenarios
- Previous Approvals from Other Authorities
- Risk Analysis

This chart is a tool for the application of the 2006 Code. Your principal authority may have additional policies and procedures for reviewing permit applications. The chart does not attempt to capture administrative processes or the path of permit refusal and appeal.

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The steps for applying the 2006 Code using Division B are discussed below. The example of a new 4-storey apartment building will be used to illustrate the process.

Step 1: Receive Application Conforming to Div. C, Clauses 1.3.1.3.(5)(a) to (e)

The application and drawings are received to start the process. A quick check is necessary to determine that the application is complete and the appropriate fees are paid.

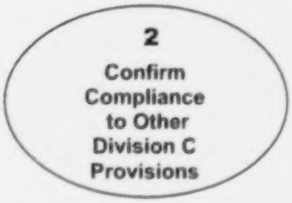
- Consult *Building Code Act*.
- Determine if the Code applies to the situation.

You should confirm that the proposed work is within the scope of the Code. The Building Code Act contains a general application statement in Subsection 8.-(1):

No person shall construct or demolish a building or cause a building to be constructed or demolished unless a permit has been issued therefore by the Chief Building Official.

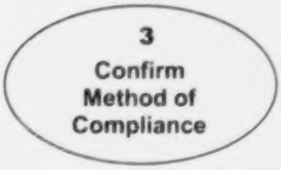
Based on this condition and Subsection 8.-(11) of the Act, the 2006 Code is applicable to the construction of a 4-storey residential building.

Step 2: Confirm Compliance with other Division C provisions



Division C contains administrative provisions including designer qualifications and the information required on drawings and in specifications. A quick review of the drawings and specifications is necessary to determine that these provisions have been met.

Step 3: Confirm Method of Compliance



The 2006 Code contains a compliance provision in Division A, Article 1.2.1.1. This states that there are two methods of achieving compliance with the Code.

One method is to comply with the applicable provisions of Division B.

The other method is to use an *alternative solution*, which is the new term for an equivalency. *Alternative solutions* are examined in greater detail in later modules.

Unless the applicant has submitted the documentation required by Division C, Part 2, Section 2.1., indicating that an *alternative solution* is proposed, proceed to evaluate for compliance with Division B.

If the proposed method of compliance is using *alternative solutions*, you would proceed to evaluate the *alternative solutions* as indicated in Step 4b in the sample flow chart for applying the 2006 Code.

4a
Confirm Compliance with Applicable Division B Provisions

As a comparison, the 1997 Code also contains two methods of compliance, although it does not include an explicit compliance statement. Compliance under the 1997 Code means satisfying requirements of the applicable Parts of the Code. The second method of compliance, called equivalencies, is permitted in Section 2.7 of the 1997 Code which operates in tandem with Section 9 of the *Building Code Act*.

Step 4a: Confirm Compliance With Applicable Division B Provisions

In this step, the Code provisions that must be satisfied by the proposed design are identified and compliance is confirmed.

In order to find the applicable Division B provisions, first you must determine which Parts apply to the new 4-storey apartment building. Division A, Subsection 1.1.2. of the 2006 Code identifies the application of specific Parts of Division B depending on the size and use of the building.

According to Div. A, Subsection 1.1.2., Parts 1, 7 and 12 in Division B are applicable to all buildings. Parts 3, 4, 5 and 6 in Division B are applicable to the new 4-storey apartment building since the building exceeds 3 storeys in building height. Within each Part, there are Articles that identify the scope and application of certain Sections or Subsections.

As a comparison, under the 1997 Code, Section 2.1. directs the application of certain Parts of the Code depending on the size and use of the building.

Final Step
Acceptance or Refusal and Document Retention

The plans review for compliance with the technical requirements can proceed in the same way as it did under the 1997 Code.

Step 5a: (Optional) Consult *Objectives/ Functional Statements*

This step may help clarify the reasons for the Code provision or when the provision applies. Intent and application statements will be discussed in Modules 4 and 5.

Final Step: Acceptance or Refusal and Document Retention

The acceptance or refusal is the decision of the person having jurisdiction. The documentation of the decision and the retention of documents are not prescribed in the 2006 Code. These are matters of policies adopted by the principal authority considering its risk management program.

STOP

Summary of Applying the 2006 Code Using Division B

The process of applying the provisions of Division B of the 2006 Code is very similar to that of applying the 1997 Code. In each process:

- *Building Code Act* is the authority for the enforcement of the Code,
- there are statements for the scope and application of the provisions of the Code,
- two methods for compliance, and
- applicable technical provisions.
- see Figures 3-1 and 3-2 in Manual

While the 2006 Code differs in content and organization and includes new tools to assist in interpreting and verifying Code compliance, the *process* of applying the 2006 Code when using Division B provisions is virtually the same as the process for the 1997 Code. Figures 3-1 and 3-2 illustrate the similarities.

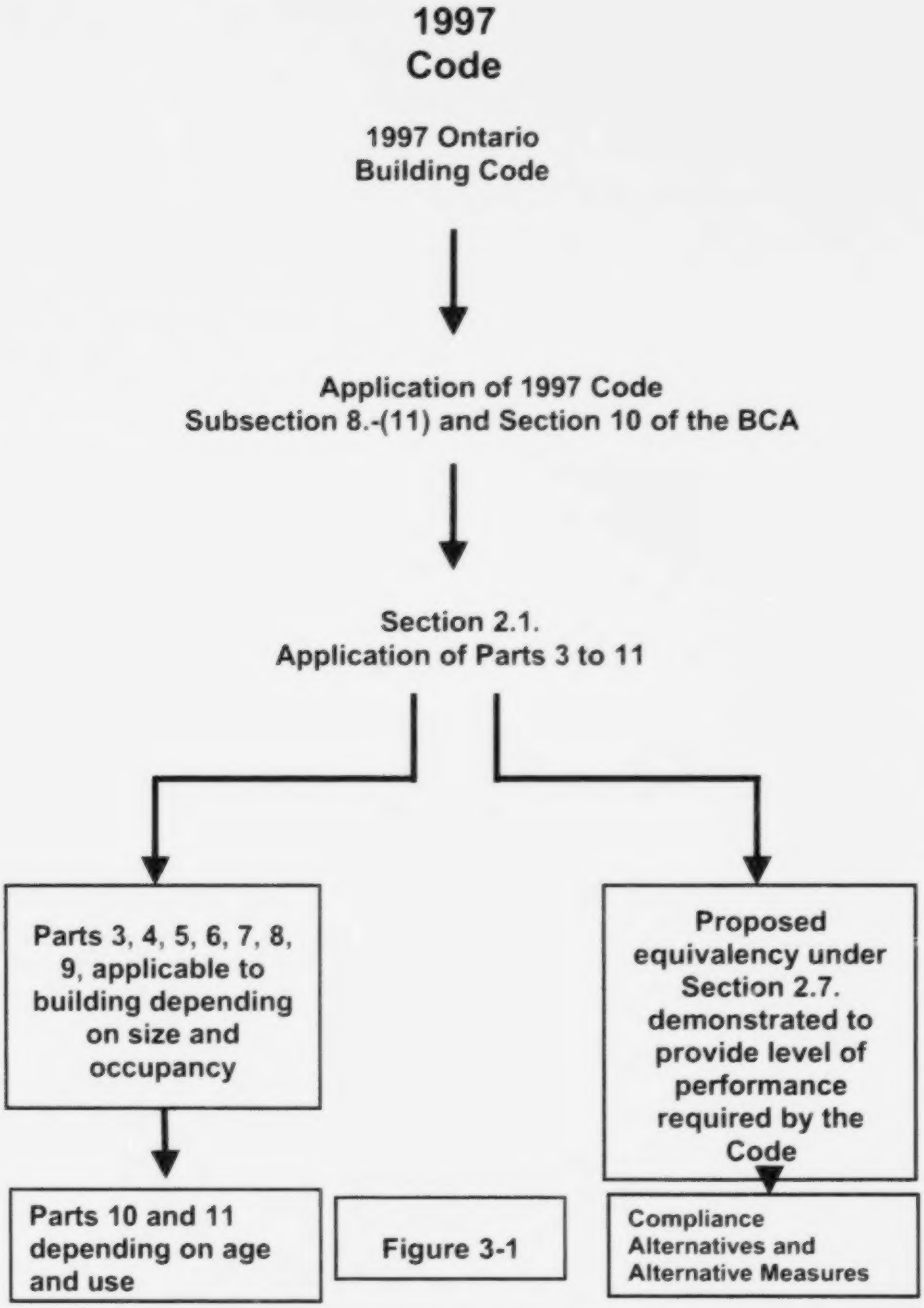

1997
Code
1997 Ontario
Building Code
Application of 1997 Code
Subsection 8.-(11) and Section 10 of the BCA
Section 2.1.
Application of Parts 3 to 11
Parts 3, 4, 5, 6, 7, 8, 9, applicable to building depending on size and occupancy
Parts 10 and 11 depending on age and use
Proposed equivalency under Section 2.7. demonstrated to provide level of performance required by the Code
Compliance Alternatives and Alternative Measures

Figure 3-1

2006
Code

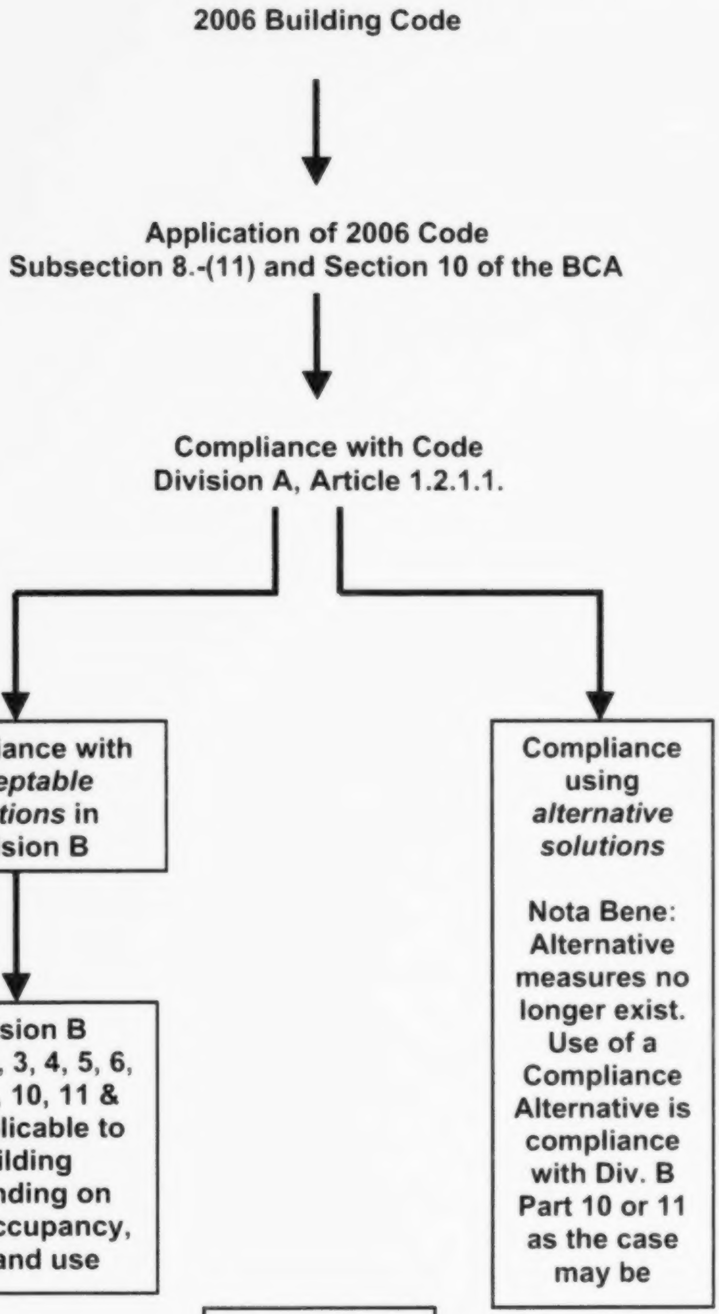

2006 Building Code
Application of 2006 Code
Subsection 8.-(11) and Section 10 of the BCA
Compliance with Code
Division A, Article 1.2.1.1.
Compliance with *acceptable solutions* in Division B
Division B
Parts 1, 3, 4, 5, 6, 7, 8, 9, 10, 11 & 12 applicable to building depending on size, occupancy, age and use
Compliance using *alternative solutions*
Nota Bene: Alternative measures no longer exist. Use of a Compliance Alternative is compliance with Div. B Part 10 or 11 as the case may be

Figure 3-2

Exercise 3-2

The purpose of this exercise is to practice using the 2006 Code.

Scenario: A homeowner has submitted a building permit application to build a one-storey addition to a house that includes 38 mm x 140 mm (2" x 6") roof joists. Based on the span, size, grade and spacing of the joists, and the specified snow load for the area, you suspect, from experience, that this design is not adequate. The project does not involve plumbing or a sewage system. The house is ten years old. The provisions of Div. A, Article 1.1.2.7. apply to this house but applying the said provisions is not part of the exercise.

Answer the questions below and identify the 2006 Code references (including Division) where applicable.

1. How do you know that the Code is applicable to an addition to a house?

   ____

2. The applicant has not submitted documentation of *alternative solutions* required by Div. C, Section 2.1. What compliance method is the applicant intending to follow?

   ____

3. Identify the Parts of Division B that are applicable to this house and how do you know?

   All Applicable Parts:

   ____

   2006 Code References: ______________________

4. Consult Div. A, Sentence 1.1.2.7.(1) and determine if Div. B, Parts 9 and 12 apply to the existing building.

5. What Sentence refers to the span tables A-4 and A-5 for roof joists?

   ____

Exercise 3-3

The purpose of this exercise is to practice using the 2006 Code.

Scenario: A building permit application for a new one-storey 700 m^2 office building has been submitted. The washrooms will be located on a small mezzanine with stair access only. You are required to verify if this design complies with the 2006 Code.

Answer the questions below and identify the 2006 Code references (including Division) where applicable.

1. The applicant has stated that he/she is proposing to comply with Division B of the Code. What is the 2006 Code reference for this method of compliance?

   ____

2. Identify the Parts of Division B that are applicable to this building and how do you know?

   Applicable Parts: ______________________

   2006 Code Reference: ____________________

3. What Article states that this building is required to meet *barrier-free* design requirements?

   ____

4. What Division B provision identifies the requirement that a *barrier-free* path of travel must be provided to a *barrier-free* washroom designed to accommodate disabled persons in this building?

   ____

Summary

- Unless the applicant proposed an *alternative solution*, by providing the documentation prescribed in Div. C, Section 2.1., proceed to evaluate compliance with Division B.
- The steps to apply the 2006 Code are:
  1. Receive Application Conforming to Div. C, Clauses 1.3.1.3.(5)(a) to (e)
  2. Confirm Compliance With Other Division C Provisions
  3. Confirm Method of Compliance under Div. A, Clause 1.2.1.1.(1)(a) using *acceptable solutions*
  4. Confirm Compliance With Applicable Division B Provisions
  5. (Optional) Consult *Objectives* and *Functional Statements*

  Final Step: Acceptance or Refusal and Document Retention

Review

As a result of this module, I am able to:

- ○ Describe the steps to apply the 2006 Code
- ○ Apply the 2006 Code to a typical design under Division B

Where Do We Go From Here?

The process to apply the 2006 Code using Division B provisions is very similar to the process to apply the 1997 Code. With this knowledge you can apply the 2006 Code to typical designs, and you have a foundation for dealing with *alternative solutions*.

END OF MODULE 3

Module 4

History of Objective-Based Codes

Introduction

This module provides a brief overview of the history of the 2006 Code to explain the reasons why *Objective*-Based Code have been introduced and what it means for the construction industry.

Learning Outcomes

At the end of this module, you will be able to:

- Answer the question: What is an *Objective*-Based Code?
- Be aware of the Canadian Code development process
- Describe two goals of the change to *Objective*-Based Codes
- Describe the benefits of *Objective*-Based Codes
- Explain the difference between an *Objective*-Based Code and a "Performance Code."

What is an *Objective*-Based Code?

The 2006 Code is, very simply, an updated 1997 Code with *objectives* and *functional statements* linked to each technical requirement. These *objectives* and *functional statements* are listed in Division A, Tables 2.2.1.1. and 3.2.1.1. respectively.

The *Objective*-Based Code also requires that an *alternative solution* (previously called an equivalent) be compared to the technical requirements using the *objectives* and *functional statements*.

An *Objective*-Based Code is a code in which every requirement achieves at least one of its *objectives*.

Overview of Canadian Code Development Process

The National Codes are developed by the Canadian Commission on Building and Fire Codes (CCBFC). The CCBFC is a group of volunteers appointed by the National Research Council of Canada (NRC). The members represent all sectors of the code-using community across Canada.

The CCBFC is responsible for the content of the Code and is assisted by standing committees, which are also composed of volunteers. The Canadian Codes Centre in NRC's Institute for Research in Construction provides technical support to the committees.

Some provinces and territories adopt the National Model Code as published. Most others use the National Code, but add or change some requirements. Because the National Model Code is the core of all provincial and territorial regulations, advice from the 13 provinces and territories is an important part of National Code development.

The Provincial/Territorial Policy Advisory Committee on Codes (PTPACC) is made up of senior representatives from provincial and territorial ministries responsible for the regulation of buildings, fire safety or plumbing. This committee provides advice to the CCBFC so that the National Model Codes better meet the regulatory needs of the provinces and territories. (see Figure 6-1)

In addition to this broad-based consensus process, the public is invited to review and comment on all proposed technical changes to the Code during a joint national-provincial-territorial public consultation. All comments are reviewed by the standing committees before they make their final recommendations on Code changes to the CCBFC.

Ontario Develops it's Building Code in parallel with the model codes and incorporates amendments where they do not conflict with provincial policy.

STOP

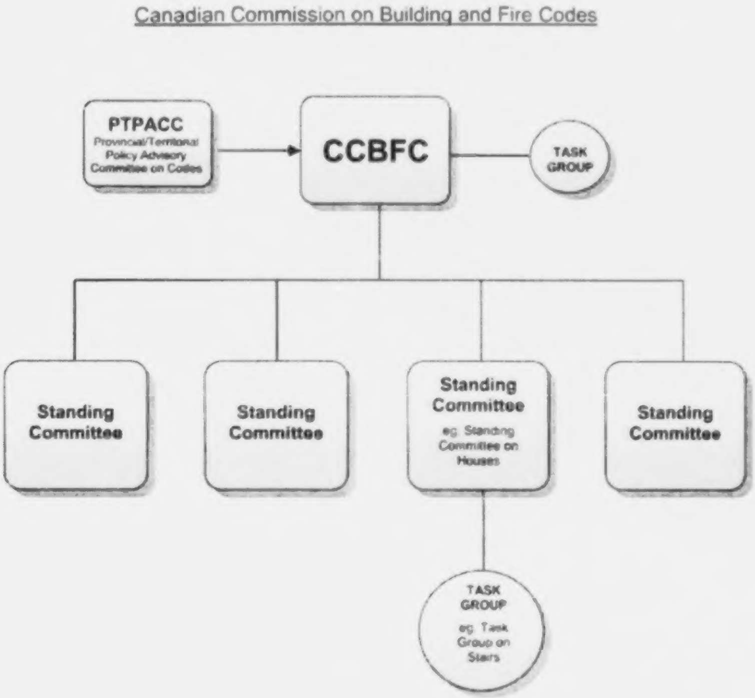

Canadian Commission on Building and Fire Codes
PTPACC
Provincial/Territorial Policy Advisory Committee on Codes
CCBFC
TASK GROUP
Standing Committee
Standing Committee
Standing Committee
eg. Standing Committee on Houses
Standing Committee
TASK GROUP
eg. Task Group on Stairs

Figure 4-1: Canadian Commission on Building and Fire Codes

Incentive for Conversion to *Objective*-Based Codes

In the early 1990's, the CCBFC was faced with a growing demand to make the Codes:

1. clearer and easier to use, and
2. more flexible and adaptable to renovations, innovative design and new technologies.

Canada's building stock is aging. Renovation or change of use is common. There is a need to give designers more flexibility to update older buildings, and possibly to safeguard heritage values, without reducing 21st century levels of health, safety, and protection of the building or facility.

Ontario's Building Code recognizes these issues and has incorporated Parts 10 and 11 of Division B as well as providing for Minister's Rulings, Building Materials Evaluation Commission and Building Code Commission Rulings to resolve potential issues dealing with renovations, new products and technologies.

Benefits of the Existing Codes

It was recognized that the existing Codes have many benefits that should be retained.

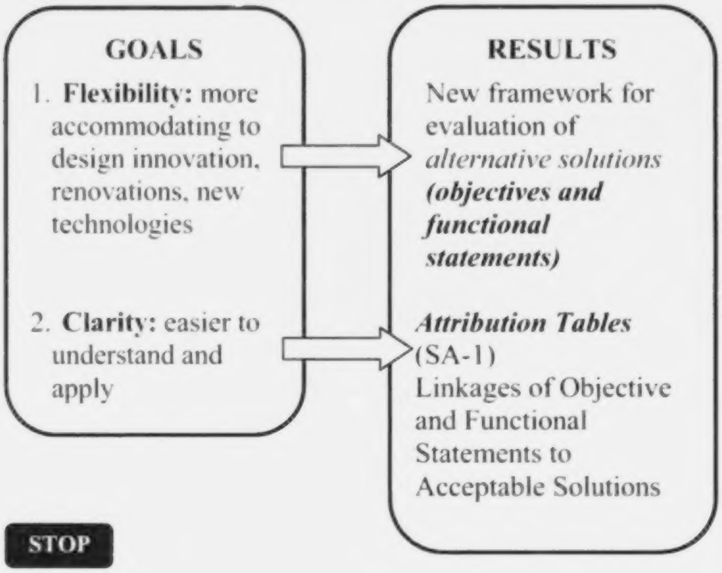
Prescriptive requirements: Many Code users appreciate the prescriptive approach that results in consistent building techniques and straightforward designs for standard buildings.

Established level of risk tolerance: The existing Codes represent the risk tolerance of the Canadian public through 50 years of public consultation. Any modifications to the Codes would need to respect that established level of risk tolerance.

The Decision to Convert to *Objective*-Based Codes

In 1995, after consulting Code users, the CCBFC directed its committees and Canadian Codes Centre staff to begin analysing the Code and other work to achieve the flexibility and clarity goals described in its Strategic Plan. *Objective*-Based Codes, together with intent and application statements, were the result.

Goals for the 2006 Code


GOALS
1. **Flexibility:** more accommodating to design innovation, renovations, new technologies
2. **Clarity:** easier to understand and apply
RESULTS
New framework for evaluation of *alternative solutions* ***(objectives and functional statements)***
Attribution Tables (SA-1) Linkages of Objective and Functional Statements to Acceptable Solutions

STOP

How Is Compliance Flexibility Improved in the 2006 Code?

There have always been two ways to comply with the Code:

1. Comply with the technical requirements that are stated in the Code.

   - This option has been retained (no change from the 1997 Code). Technical requirements are now called ***acceptable solutions*** and are located in Division B.

2. Demonstrate that a proposed equivalent will perform at least as well as the technical requirements.

   - This option has been improved. Equivalencies are now called ***alternative solutions***, and there is additional information available that will make it easier to compare alternative products, designs and materials to the Code provisions.

Compliance Options in the 2006 Code

Option 1 – Comply with Division B Provisions	Option 2 – Use an *Alternative solution*

• Based on Div. A. 1.2.1.1.(1)(a)
• Comply with Division B ***acceptable solutions*** (technical requirements)
• "Business as Usual"
	• Based on Div. A. 1.2.1.1.(1)(b)
	• Demonstrate that an ***alternative solution*** (equivalent) performs at least as well as applicable Division B technical provisions.
	New
	• More information to compare proposed *alternative solution* with Division B requirements:
	  • *Objectives*
	  • *Functional statements*

Objectives and *functional statements* together define what function an *alternative solution* must perform and the reasons why.

Compliance option 1.2.1.1.(1)(b) - using *alternative solutions* - in the 2006 Code is intended to support innovation, make the

Code easier to apply to existing buildings, and provide more assurance to all parties that the *alternative solution* has equivalent performance.

Benefits of *Objective*-Based Codes

***Objective*-Based Codes are intended to provide the following benefits:**

- **Increased understanding of the reasons for Code provisions**
- **More consistent application of the Codes**
- **Ability to apply familiar provisions of previous Codes**
- **Enhanced opportunity for design and technology innovation**
- **Increased flexibility to apply Codes to existing buildings**
- **Consistent format following international code trends**

STOP

Is the 2006 Code a Performance Code?

The 2006 Code is NOT a performance code!

The majority of the 2006 technical requirements in Division B are the same as in the 1997 Code, with updates. The 1997 Code contained both prescriptive requirements and performance requirements.

Prescriptive requirements can usually be confirmed by visual inspection or simple measurement. For example, an exit stair riser must have a height between 125 and 200 mm.

Performance requirements can be confirmed by tests, calculations or engineering analysis. For example, residential occupancies must be separated from other major occupancies by a fire separation having a fire resistance rating of not less than 1 hour.

This is a performance requirement because the designer is not told **how** to achieve that required performance. There are several wall construction design options that may achieve the 1-hour performance rating.

The difference between prescriptive and performance requirements is covered in more detail in Module 11.

The 2006 Code contains the same mixture of prescriptive and performance requirements as the 1997 Code. A true performance code would contain only performance provisions.

Converting all prescriptive requirements to true performance requirements would take many years of effort and research. There is also a concern that a move towards true performance codes might lead to inconsistent application of the code or to lower performance than was intended.

How Were Code *Objectives* Determined?

The CCBFC asked its standing committees to analyze every technical requirement in the Code and to document why each requirement was in the Code. This analysis led to the development of intent statements, application statements, *objectives* and *functional statements*.

The analysis discovered that all but a few provisions help achieve the goals of safety, health, accessibility, and/or protection of the building. These became the Code *objectives*. *Objectives* state what the Code aims to achieve.

Building Code *Objectives* (including Plumbing *Objectives*)

OS	Safety
OH	Health
OA	Accessibility
OP	Fire, Structural, Water and Sewage Protection of Buildings
OR*	Resource Conservation
OE*	Environmental Integrity
OC*	Conservation of Buildings

* Category of *Objective* is unique to Ontario

Fire Code *Objectives* (Ontario's Fire Code is not currently in an *objective*-based format)

OS	Safety
OH	Health
OP	Fire Protection of Buildings and Facilities

These *objectives* define the boundaries of the Code.

Requirements That Do Not Meet an *Objective*

Every requirement in an *Objective*-Based Code must help achieve one or more of its *objectives*. If a proposed change does not help achieve one of the *objectives*, it will not be included in the Code.

The analysis showed that a few 1997 Code requirements did not meet any of the seven top-level *objectives*. These requirements were modified or deleted.

Modified Provision

The Sentences below were modified by adding the word "exterior." This is because interior beams only need to be painted for appearance, not for a structural safety *objective* OS2.3 ... *structural failure ... caused by damage to or deterioration of building elements*.

Div. B., 9.17.3.3. Paint

1) **Exterior** steel columns susceptible to corrosion shall be treated on the outside surface with at least one coat of rust-inhibitive paint.

Div. B, 9.23.8.2. Priming of Steel Beams

1) **Exterior** steel beams susceptible to corrosion shall be shop primed with rust-inhibitive paint.

Additional *Objectives* in the Ontario Building Code

Ontario has added three categories of *objectives* being Resource Conservation, Environmental Integrity and Conservation of Buildings.

As an additional example, Ontario added *objective* OH7 Health – View To The Outdoors to its 2006 Building Code to allow it to retain minimum window area requirements.

As well, the provinces and territories, through PTPACC, may in the future direct the CCBFC to add *objectives* to the National Model Code.

Who Developed the *Objectives*, Intents etc.?

Many people and organizations have been involved in the development of intent statements, *objectives*, *functional statements* and application statements. This includes the Canadian Codes Centre, the Canadian Commission on Building and Fire Codes and its Standing Committees, the Ontario Ministry of Municipal Affairs and Housing, representatives and legal experts from other provincial and territorial governments, consulting firms and code users who participated in the public consultations.

STOP

One Other Thing to Remember

The Building, Fire and Plumbing Codes are regulatory documents; they are NOT comprehensive design documents.

A building design must meet the minimum requirements of the Codes. However, the Codes do not provide a manual on how to design a building.

The Code sets minimum requirements for some aspects of health, safety, accessibility and structural and fire protection of buildings. However, a designer must consider many other aspects, such as:

- Other regulations, and by-laws,
- Standards (referenced documents),

- Design manuals,
- Good engineering practice,
- Manufacturer's information,
- Insurance requirements, and
- Owner requirements and goals.

For more information on *Objective*-Based Codes and Canada's code development system, visit http://www.nationalcodes.ca/ and http://obc.mah.gov.on.ca

Summary

- An *Objective*-Based Code is a code in which every requirement achieves at least one of its *objectives*.
- The Canadian Code development process is based on input from Code users across Canada, including provincial and territorial governments and the public. Provinces adopt the National Model Codes, or publish provincial codes based on the model code.
- Two goals of the change to *Objective*-Based Codes are:
    - **Flexibility:** more accommodating to design innovation, renovations, new technologies
    - **Clarity:** easier to understand and apply
- *Objective*-Based Codes are intended to provide the following benefits:
    - **Increased understanding of the reasons for Code provisions**
    - **More consistent application of the Codes**
    - **Ability to apply familiar provisions of previous Codes**
    - **Enhanced opportunity for design and technology innovation**
    - **Increased flexibility to apply Codes to existing buildings**
    - **Consistent format following**

international code trends

- An *Objective*-Based Code is not a performance code. The 2006 Code continues to contain a mix of prescriptive and performance requirements.

Self-Assessment

As a result of this module, I am able to:

- ☐ Answer the question: What is an *Objective*-Based Code?
- ☐ Be aware of the Canadian Code development process
- ☐ Describe two goals of the change to *Objective*-Based Codes
- ☐ Describe the benefits of *Objective*-Based Codes
- ☐ Explain the difference between an *Objective*-Based and a "performance code."

Where Do We Go From Here?

Alternative solutions will be introduced in Module 5. Then in Module 6 you will have a chance to apply your new knowledge of the 2006 Code to case studies.

END OF MODULE 4

Module 5

Introduction to Alternative Solutions

Introduction

The term "*alternative solution*" is defined in Division A, Clause 1.4.1.2.(1)(b) of Ontario's 2006 Building Code. It is synonymous to the term "equivalent" found in former Section 9 of the *Building Code Act* that was associated with Section 2.7. of the 1997 Code. This module will introduce the concept of *alternative solutions* and compare it to equivalents.

Learning Outcomes

At the end of this module, you will be able to:

- Describe an *alternative solution* and give examples
- Describe how *alternative solutions* compare to equivalents
- Identify the seven top-level categories of objectives from memory
- Find pairs of *objectives* and *functional statements* linked to the *acceptable solution* provisions in Division B
- Identify the "areas of performance" to be evaluated for an *alternative solution*

Module Outline

A. Equivalents and *alternative solutions*

B. *Objectives, functional statements* and attributions

C. Evaluating *alternative solutions*

A. Equivalents and Alternative Solutions

Alternative solutions are very similar to what equivalents were under the 1997 Code. For this reason, this module begins with a comparison of *alternative solutions* to equivalents as well as an analysis of the provisions of Division A, Clause 1.2.1.1.(1)(b) in the 2006 Code that recognizes the use of *alternative solutions*.

Equivalents in the 1997 Code

Sentence 2.7.1.1.(1) in the 1997 Code states:

> *A chief building official or registered code agency may allow under Section 9 of the Act, the use of materials, systems or building designs not authorized by this Code, if the use of the proposed materials, systems or building designs:*

> *a) is permitted under Section 2.7.*
>
> *b) will in the opinion of the chief building official or registered code agency, provide the level of performance that would be achieved by conforming to the requirements of the Code*

In the 1997 Code an equivalent material or system could differ from the provisions of Parts 3, 5, 6, 7, 8 and 9 of that Code. Equivalent building design was limited to Part 4 Structural Design. Code users may have had the false impression that an equivalent meant that the Code had not been met. That was not so, Sentences 2.7.2.1.(1) [materials], 2.7.2.2.(1) [systems] and 2.7.2.3.(1) [building designs] of the 1997 Code confirm that an equivalent is a method of achieving compliance with the Code if it provides the level of performance that would be achieved by conformance with the requirements of the building code in Parts 3 to 9.

Under Ontario's 2006 Building Code equivalents are called *alternative solutions*. The basic idea is the same; however, the 2006 Code provides you with a basis for evaluating *alternative solutions*. **Take note** that building design is no longer limited to Part 4 and *alternative solutions* may be used in achieving compliance with the provisions of Division B, Part 10 Change of Use and Part 11 Renovation.

Before we deal with the suggested methodology for the evaluation of *alternative* solutions, we will look at examples of equivalents under the 1997 Code and *alternative solutions* under Ontario's 2006 Building Code.

Examples of Proposed Equivalents

The 1997 Code states that the use of equivalent materials, systems and building designs, not recognized by the Code may be allowed if the level of performance that would be achieved by conforming to the Code is achieved.

An example of a proposed equivalent material may involve a roofing material that does not conform to the material standards listed in Article 9.26.2.1.

An example of a proposed equivalent system could be a wall system of straw bale construction.

An example of a proposed equivalent building design may involve a material (plastic guards) that does not have a design basis identified in Section 4.3. of the Code.

STOP

Exercise 5-1

Briefly discuss and write down examples of proposed equivalents that you may have dealt with or been involved with in your past work experience, under the 1997 Code.

Proposed Equivalent

1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________
5. ______________________________
6. ______________________________

Examples of Proposed Alternative Solutions

Under the 2006 Code, proposed *alternative solutions* will likely be very similar to the types of equivalents that were proposed in the past. *Alternative solutions* are also likely to be quite different because under the *alternative solutions* provisions of Div. A, Clause 1.2.1.1.(1)(b) building design is not restricted to Part 4 of the Code. The following are examples of possible proposed *alternative solutions*:

Alternative Solution for a material: An exterior siding material, for a Div. B, Part 9 building, that is not referenced in Section 9.27.

Alternative Solution for a system: A wall assembly that is tested for fire-resistance rating to a standard not referenced in Div. B, Table 1.3.1.2. of the Code.

Alternative Solution for a building design: A theatre seating layout that has dead-end aisles more than 10 m long as regulated by Div. B, Sentence 3.3.2.4.(11.1).

A proposed alternative solution is any proposed product, material, component, design, system, equipment or procedure that does not comply with the applicable Division B provisions.

Why Are Alternative Solutions Proposed?

The construction industry, architecture, engineering and technology are always evolving and developing new ways of doing things. Building owners and designers expect to be able to use new products and innovative technologies. However, at the same time, society expects that the performance and suitability of a new technology will be verified prior to use.

Alternative solutions may be proposed for renovations [Div. B, Part 11] or changes of use [Div. B, Part 10] in existing buildings where the original construction does not comply with current provisions of the Code, including *compliance alternatives*.

Who Proposes Alternative Solutions?

Alternative solutions are proposed by designers who want to use a building design, system or material that is regulated by the provisions of Division B of the Code, but does not meet the *acceptable solutions* of specific Division B provisions.

It is the responsibility of the designer to propose an *alternative solution*. It is not the duty of the person having jurisdiction to develop an *alternative solution* to help an applicant for a permit, a holder of a permit or a person to whom an order has been given.

Sometimes the person having jurisdiction may wish to suggest to the designer to consult specific Rulings by the Building

Code Commission or the Minister, based on his or her experience. However, the person having jurisdiction should refrain from suggesting *alternative solutions* based on his or her experience in order to avoid liability and the possibility that the suggestion may be taken as a "pre-approved alternative solution".

The designer referred to above may be a person who has qualifications set out in Division C, Part 3, Section 3.2 of the Code, an architect who is qualified under the *Architects Act*, Building Code Designation System or a person who is exempt from registration and qualification.

A designer or owner, not the person having jurisdiction, is responsible for proposing an alternative solution.

Who Evaluates Proposed Alternative Solutions?

Clause 1.1-(6)(a) of the *Building Code* Act informs us that it is the role of the chief building official to establish operational policies for the enforcement of the building code within the applicable jurisdiction. Consequently, each principal authority may adopt specific policies and procedures for evaluating *alternative solutions* and may designate officials who are to conduct such evaluations. On the other hand, a registered code agency is required by Div. C, Clause 3.4.3.3.(3)(c) to include, in their quality management plan, procedures for the assessment of *alternative solutions*.

Facilitator / Self-Study, Participant Note: *While Div. C, Sentence 2.1.1.1.(1) requires the documentation for an alternative solution to be provided to the CBO or RCA, the person having jurisdiction is the CBO, Inspector, RCA, or the person authorized by the RCA, as the case may be, who carries out the plans review activity.*

Other authorities having jurisdiction such as utility inspection authorities (electricity and gas) may be involved to be of assistance to the person having jurisdiction.

There may be multiple parties involved in the evaluation of complex *alternative solutions*. For example, if an *alternative solution* involves a fire safety matter, a principal authority may require the Fire Department and Building Department to be involved. In the case of plumbing, the Building and Engineering Departments and the Health Unit may be involved. The level of consultation with agencies other than the Building Department may vary between principal authorities.

The person having jurisdiction is responsible for the evaluation of the proposed alternative solution.

STOP

Compliance with Division B

Compliance with Division B is a must. Compliance with Division B is achieved by:

1. complying with the *acceptable solutions* in Division B

OBC reference: Div. A, Clause 1.2.1.1.(1)(a)

OR

Facilitator / Self-Study, Participant Note: *Compliance is confirmed by the plans review and inspection activities; whether compliance is achieved with the use of acceptable solutions or alternative solutions.*

2. using *alternative solutions that will achieve the level of performance required by the applicable acceptable solutions (of Division B) in respect of the objectives and functional statements attributed to the applicable acceptable solutions in Supplementary Standard SA-1*

OBC reference: Div. A, Clause 1.2.1.1.(1)(b)

There are three important components to Clause 1.2.1.1.(1)(b) and we will examine them separately:

- *Alternative solutions* as a compliance method
- *Level of performance of acceptable solutions*
- Evaluating *alternative solutions*

Alternative Solutions as a Compliance Method

Div. A, Clause 1.2.1.1.(1)(b) makes it clear that *alternative solutions* are recognized as a method of complying with the provisions of Division B of the Code.

The wording also makes it clear that *alternative solutions* are not a way "to get out of" Division B Code provisions, and they are not a "second best" way to comply with Division B of the Code.

Div. A, Clause 1.2.1.1.(1)(b) and Div. C, Section 2.1. do not require a proponent to give a reason why an *alternative solution* is being sought instead of using an *acceptable solution*.

However, the proponent must satisfy the person having jurisdiction that the proposed *alternative solution* will:

> *achieve the level of performance required by the applicable acceptable solutions (of Division B) in respect of the objectives and functional statements attributed to the applicable acceptable solutions in Supplementary Standard SA-1*

Use of alternative solutions is one of the two acceptable methods of complying with Division B of the Code.

STOP

Level of Performance

> Div. A, Clause 1.2.1.1.(1)(b) informs us that *alternative solutions* ***must achieve the level of performance required by the acceptable solutions (of Division B)*** *in respect of the objectives and functional statements attributed to the applicable acceptable solutions in Supplementary Standard SA-1.*

In the 2006 Code, *alternative solutions* are to be measured against the level of performance required by Division B. This is the same basic idea as for equivalents in the 1997 Code since equivalents had to achieve the level of performance that would be achieved by conforming to the Code.

Every requirement in Division B has a level of performance associated with it; whether it is a "prescriptive" or "performance" based requirement. Level of performance is explored in greater detail in Module 11. ***The level of performance*** can be thought of as the (lowest/minimum) level of performance of a material, system or building design that is required by the Division B provision.

For example, a designer who proposes to use a window that does not comply with the standards referenced in Division B, Sentence 9.7.2.1.(1) would have to submit acceptable proof that the alternative window performs **at least as well as** one that does meet the CAN/CSA-A440 standard and any other related requirements for windows in Division B.

By making Division B the benchmark of level of performance for *alternative solutions*, the Code makes it clear that *alternative solutions* must be "**at least as good as**" the *acceptable solutions* in Division B.

Since Division B is the minimum provisions that have been prescribed under the authority of Section 34 of the *Building Code* Act, for the construction of buildings, all *alternative solutions* must demonstrate compliance with the level of performance of the requirements and provisions of Division B.

Alternative solutions must as a minimum provide the level of performance required by the Division B provisions.

STOP

Evaluation of Alternative Solutions

We have established that:

- The use of an *alternative solution* is one of the two methods that provide compliance with the Code; and,
- The benchmark for the evaluation of an *alternative solution* is the level of performance (lowest/minimum) required by the Division B provision.

Now, how do we know ***what*** to evaluate for the proposed *alternative solution*?

Div. A, Clause 1.2.1.1.(1)(b):

> *Compliance with this Code can be achieved by… using alternative solutions that will achieve the level of performance required by the applicable acceptable solutions (of Division B)* ***in respect of the objectives and functional statements attributed to the applicable acceptable solutions in Supplementary Standard SA-1****.*

The 2006 Code states the framework for the evaluation of *alternative solutions* consists of two steps.

"…***in respect of the objectives and functional statements…***" means that the evaluation is limited to the "areas of performance" that the Code addresses. In broad terms, only issues of safety (OS), health (OH), accessibility (OA), fire, structural, water and sewage protection of buildings (OP), resource conservation (OR), environmental integrity (OE) and conservation of buildings (OC) identified in Div. A, Table 2.2.1.1. and *functional statements* found in Div. A, Table 3.2.1.1. can be considered when evaluating an *alternative solution.*

"…attributed to the applicable acceptable solutions in Supplementary Standard SA-1" means that only the pairs of *objectives* and *functional statements* that are linked to the Division B provisions in Supplementary Standard SA-1, are used for evaluating the *alternative solution.* For example, if an alternative framing system was proposed, one would look at the *objectives* and *functional statements* linked to framing requirement. The *objectives* and *functional statements* linked to ventilation would not be applicable, because they are not in the "areas of performance" provided by the linked pairs of *objectives* and *functional statements* found in SA-1.

Each Div. B requirement (acceptable solution) is linked to at least one objective and one functional statement, called a pair. The linked pairs of objectives and functional statements define the "areas of performance" (… in respect of ...) to be evaluated for an alternative solution.

Summary	
Equivalents **(1997 Code)**	**Alternative Solutions** **(2006 Code)**
Permitted under Sections 9 of the *Building Code* Act and 2.7. of the Code	Permitted under Div. A, Clause 1.2.1.1.(1)(b) of the Code
Must meet level of performance that would be achieved by conforming to the Code	Must meet the level of performance of Division B
Minimal framework for evaluation	Evaluated using prescribed *objectives* and *functional statements*
Allowed by CBO or RCA **if** in the opinion…	Assessed by person having jurisdiction and may be accepted or refused

B. Objectives, Functional Statements and Attribution Tables

Objectives and *functional statements* will now be examined in more detail since they are the tools used in the evaluation of *alternative solutions*.

Objectives

According to Div. A, Clause 1.4.1.2.(1)(b), *objective* means an objective set out in Div. A, Table 2.2.1.1.

Objectives describe the overall goals that the provisions of Division B of the Code intend to achieve.

**Seven Categories of Objectives
of the 2006 Building Code**

OS	**Safety**
OH	**Health**
OA	**Accessibility**
OP	**Fire, Structural, Water and Sewage Protection of Buildings**
OR	**Resource Conservation**
OE	**Environmental Integrity**
OC	**Conservation of Buildings**

These seven categories of *objectives* serve to define the boundaries of the Code; and for training purposes, we will call them top-level objectives. They are a useful reminder of the areas in respect to which the Code applies. The *objectives* are limited to those listed in Div. A, Table 2.2.1.1.

It is recommended that you memorize the seven categories of top-level *objectives* of the Code since they will help you quickly identify the ultimate purpose of a specific Code provision. There are second and third-level *objectives* under most of the top-level objectives e.g.OS1 and OS1.1. These will be examined in more detail in Module 10. **There is no hierarchy in value between a top, second or third-level *objective*.** Consult Div. A, Table 2.2.1.1., Column 3 and Subsection 34.-(5) of the *Building Code Act*.

Functional Statements

According to Div. A, Clause 1.4.1.2.(1)(b), *functional statement* means a function set out in Div. A, Table 3.2.1.1. that a building or an element of a building is intended to perform.

Functional statements describe the functions that a building or an element of a building must perform to fulfill the objectives.

Examples of *functional statements* are:

F04	To retard failure or collapse due to the effects of fire.
F12	To facilitate emergency response.
F34	To resist or discourage unwanted access or entry.
F54	To limit drafts.
F80	To resist deterioration resulting from expected service conditions.

Functional statements in Div. A, Table 3.2.1.1. are not presented in a particular order, although they are grouped by subject matter. There are intentional gaps in the numbering system of *functional statements* to allow for the insertion of other *functional statements* in the future. All *functional statements* are found in Div. A, Table 3.2.1.1. of Ontario's 2006 Building Code. Not all *functional statements* apply to every Part of Division B of the Code.

Attribution Tables

The Attribution Tables of Supplementary Standard SA-1 provide the link between pairs of *objectives* and *functional statements* and the applicable *acceptable solutions* of Division B. Each provision or technical requirement of Division B *acceptable solutions* is linked to at least one *objective* and one *functional statement*, called a pair, by way of the Attribution Tables in Supplementary Standard SA-1.

Each Division B requirement is linked to at least one objective and one functional statement, called a pair, as found in Supplementary Standard SA-1.

In the printed version of the Code, the Attribution Tables are in Supplementary Standard SA-1. In SA-1, the Table number matches the Division B Part number. In the electronic version of the Code, click on the icon next to the requirement to go to the proper Attribution Table.

For example, Table 9 in Supplementary Standard SA-1 shows that the linked pairs of *functional statements* and *objectives* for Sentence 9.8.4.2.(1), Dimensions for Risers, are:

[F30 – OS3.1] [F10 – OS3.7]

Functional statement F30, to minimize the risk of injury to persons as a result of tripping, slipping, falling, contact, drowning or collision is associated with *Safety in Use Objective OS3.1*, to limit the probability that, as a result of the design or construction of a building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to hazards cause by tripping, slipping, falling, contact, drowning or collision. In turn, *functional statement* F10 to facilitate the timely movement of persons to a safe place in an emergency is associated with *Safety in Use Objective OS3.7*, to limit the probability that, as a result of the design or construction of a building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to hazards caused by persons being delayed in or impeded from moving to a safe place during an emergency.

STOP

Exercise 5-2 (Guided)

Find the *objectives* related to the Part 9 requirement for the clearance of insulation in attic and roof spaces in Div. B, Sentence 9.19.1.3.(3).

Process to arrive at the answer:

Step 1: Find the applicable Division B requirement.

- **Sentence 9.19.1.3.(3), Clearances**
  Ceiling insulation shall be installed in a manner that will not restrict the free flow of air through roof vents or through any portion of the attic or roof space.

Step 2: Go to Supplementary Standard SA-1, Table 9.

- The entry for Sentence 9.19.1.3.(3) states:

  [F51, F62 – OH1.1, OH1.2, OH1.3]
  [F51, F62 – OS2.3]

Step 3: Go to Division A, Part 2, Table 2.2.1.1. to identify the *objectives*.

- OH1.1, OH1.2 and OH1.3 are under OH1 Health - Indoor Conditions

and

- OS2.3 is under OS2 Safety - Structural Safety

Answer:

- The *objectives* linked to the requirement for insulation clearances in attic and roof spaces are OH1 Health - Indoor Conditions and OS2 Safety - Structural Safety.

- Other functions of health such as, OH2 Health - Sanitation, OH3 Health - Noise Protection, etc … and OS1 Safety – Fire Safety, OS3 Safety – Safety in Use, etc … are not required to be considered for an *alternative solution* to the provisions of Div. B, Sentence 9.19.1.3.(3).

Exercise 5-3 (Guided)

Find the *functional statements* related to the Part 9 requirement for the clearance of insulation in attic and roof spaces in Div. B, Sentence 9.19.1.3.(3).

Process to arrive at the answer:

Step 1: Find the applicable Division B requirement.

- Sentence 9.19.1.3.(3), as above for *objectives*.

Step 2: Go to Table 9 in Supplementary Standard SA-1.

- The entry for Sentence 9.19.1.3.(3) states:

  [F51, F62 – OH1.1, OH1.2, OH1.3]
  [F51, F62 – OS2.3]

Step 3: Go to Division A, Part 3, Table 3.2.1.1. to identify the *functional statements*.

- F51, To maintain appropriate air and surface temperatures.
- F62, To facilitate the dissipation of water and moisture from the building.

Answer:

- The *functional statements* that are linked to the requirements of Div. B, Sentence 9.19.1.3.(3) for insulation clearances in attic and roof spaces are F51 and F62.

Exercise 5-4

1. In the printed version of the Code, what is the Code Reference for the Attribution Table for Part 6?

   ____

   List the ***alpha-numerical references*** for the linked *objectives* and *functional statements* that are associated with the provisions of Division B indicated below.

2. Div. B, Sentence 3.3.4.4.(6), Egress form Dwelling Units

   ____

3. Div. B, Sentence 3.7.4.14.(1), Grab Bar Installation

   ____

4. Div. B, Sentence 5.2.1.1.(2), Interior Environmental Loads

   ____

   ____

C. Evaluating Alternative Solutions

Modules 7 through 12 cover the evaluation of *alternative solutions* - a brief introduction is provided here.

...in respect of the objectives and functional statements attributed to the applicable acceptable solutions in Supplementary Standard SA-1

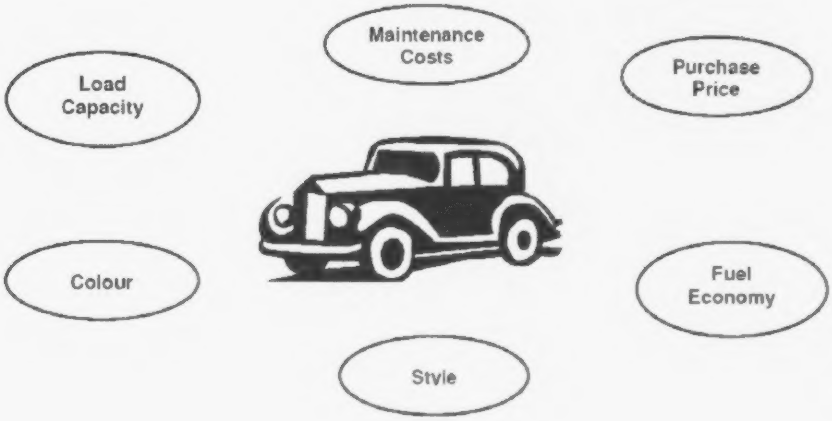
The term "... in respect of the *objectives* and *functional statements* attributed to the applicable *acceptable solutions* in Supplementary Standard SA-1" in Div. A. Clause 1.2.1.1.(1)(b) has been condensed to **"areas of performance".**

The term "in respect of ... the applicable acceptable solutions" means the provisions of Division B that the alternative solution must match, or "areas of performance" that must be matched.

We will now look at an everyday example of "areas of performance" and a Code example of attributed "areas of performance".

Everyday Example of "Areas of Performance"

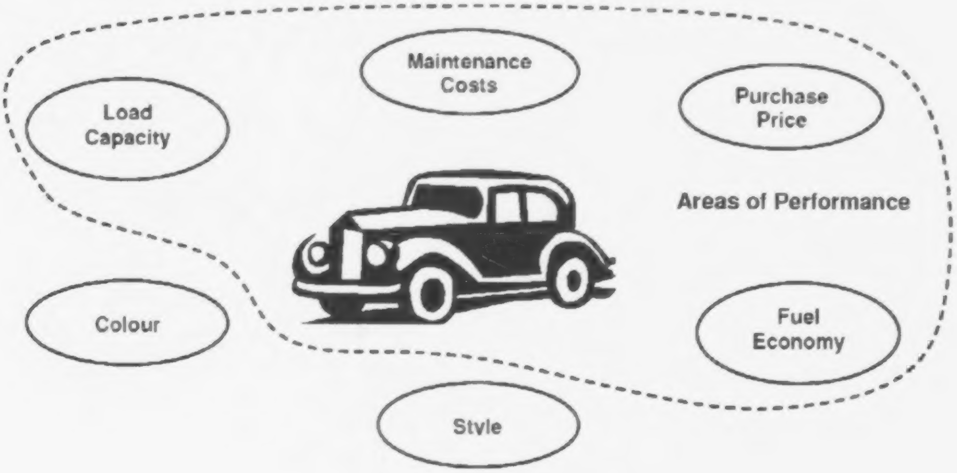
Imagine that you are shopping for a new car to replace your current vehicle. There are a number of factors that you could take into consideration as illustrated in the diagram that follows.



You may decide that certain factors are more important than others. For example, you may consider purchase price, fuel economy, maintenance costs and load capacity as the most important factors. You may decide that factors such as colour and style will not influence your decision.

In this case, the purchase price, fuel economy, maintenance costs and load capacity will be the ***"areas of performance"*** that you will use to evaluate your decision as illustrated in the diagram that follows.

When shopping for a car ***you*** will decide on the ***"areas of performance"*** that you want to use to compare and decide.

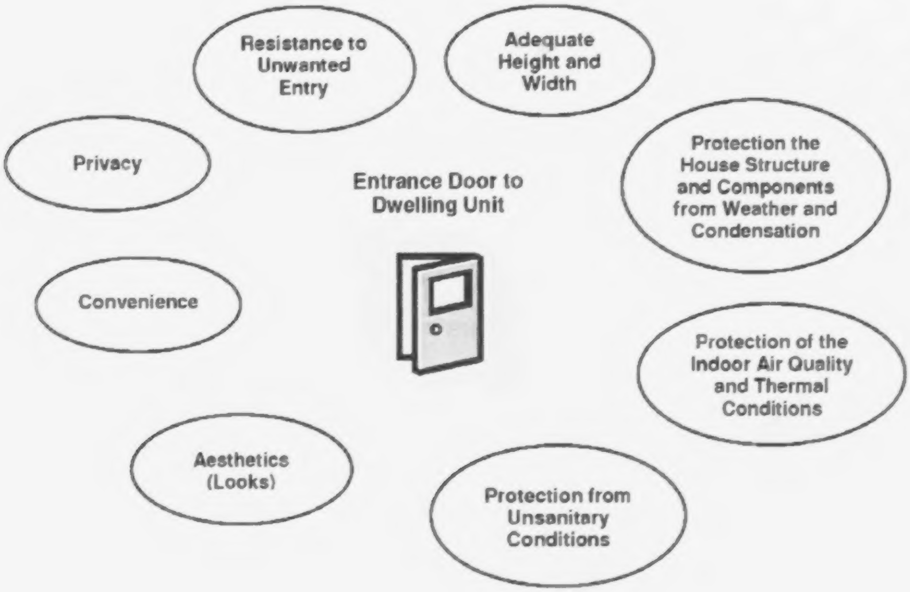


***"Areas of performance" (in respect to … the applicable acceptable solutions)* tell you what to evaluate for a proposed alternative solution.**

Code Example of "Areas of Performance"

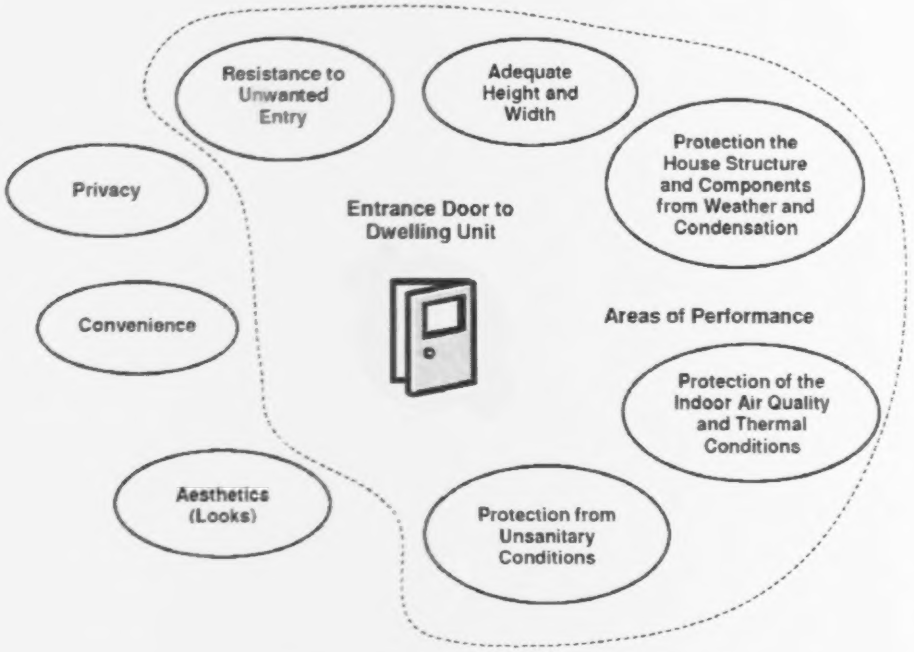
Imagine an *alternative solution* that involves an entrance door to a house. There are many possible factors that could be evaluated when comparing the entrance door to that permitted by the Code as shown in the diagram that follows.

Functions the door provides that could be considered in the selection of an entrance door are:


Resistance to Unwanted Entry
Adequate Height and Width
Privacy
Entrance Door to Dwelling Unit
Protection the House Structure and Components from Weather and Condensation
Convenience
Protection of the Indoor Air Quality and Thermal Conditions
Aesthetics (Looks)
Protection from Unsanitary Conditions

When evaluating an *alternative solution*, *the Code* tells you the "areas of performance" to evaluate. The Code narrows the "areas of performance" to ***only*** those functions that address the *objectives* of the provisions of Division B of the Code. These "areas of performance" are derived from the pairs of *objectives* and *functional statements* linked to the *acceptable solutions* (technical requirement/provision) of Division B.

For the example of the entrance door, factors such as privacy, convenience and appearance are not regulated by the Code. These factors would not be part of the evaluation of the *alternative solution*.


Resistance to Unwanted Entry
Adequate Height and Width
Privacy
Entrance Door to Dwelling Unit
Protection the House Structure and Components from Weather and Condensation
Convenience
Areas of Performance
Protection of the Indoor Air Quality and Thermal Conditions
Aesthetics (Looks)
Protection from Unsanitary Conditions

Defining the "Areas of Performance"

Every technical requirement will have at least one "area of performance" that is defined by at least one linked *functional statement* and one linked *objective* acting in pair.

For example, the requirement of Div. B, Sentence 9.6.8.8.(1) to have a door viewer in a main entrance door to a dwelling unit is linked to the pair of *functional statement* and *objective*:

[F35-OS4.2]

F35 To facilitate the identification of potential intruders.

OS Safety
OS4 Resistance to Unwanted Entry
OS4.2 – (…limit risk of injury due to) occupants being unable to identify potential intruders as such

A *functional statement* or an *objective* cannot be used on its own. The ***pair*** is required to determine the "area of performance" because it indicates what function the *alternative solution* needs to perform and the reason why.

How To Make a Pair From the Attribution Tables

The "area of performance" is derived from the functional statement-objective pair. The pair describes what needs to be done (the function) and why (the objective).

The Attribution Tables in Supplementary Standard SA-1 list and link *functional statements* and *objectives* in a compressed format. The pairs are made by linking together each of the *functional statements* with each of the *objectives* within the square brackets.

Some attributions are quite lengthy, see the *objectives* and *functional statements* attributed to Div. B, Sentence 9.3.1.7.(1), Concrete Mixes in SA-1, Table 9. You must separate the string of *functional statements* and *objectives* into separate pairs.

For example, Div. B, Sentence 9.6.7.2.(1) states "*Except as provided in Sentence (2), metal frames for doors, for glazing in doors, and for sidelights for doors shall incorporate a thermal break.*"

Supplementary Standard SA-1, Table 9 has the following entry for Div. B, Sentence 9.6.7.2.(1), Required Thermal Break.
[F63 – OH1.1, OH1.2] [F63 – OS2.3] [F131 – OR2]

Separate each of these attributions into [FS-O] pairs:

[F63 – OH1.1, OH1.2] = [F63-OH1.1]
[F63-OH1.2]

[F63-OS2.3] and [F131 – OR2] are already in pairs.

Four pairs of attributes are made for this requirement:
[F63 – OH1.1] [F63 – OH1.2]
[F63 – OS2.3] [F131 – OR2]
Therefore, there are four checks or four "areas of performance" that need to be evaluated in determining the level of performance of the *alternative solution*.

STOP

Describing the "Area of Performance" in Words

A pair is required because it fully answers the question, "What does the *alternative solution* need to do and why?" The reason for the function will not be clear if the *objective* is not part of the paired statement.

The "area of performance" can be stated as:

> "The *alternative solution* must <**functional statement**> for <**objective**> reasons."

For [F63 – OH1.1], the *objective* and *functional statement* in Division A, Tables 2.2.1.1. and 3.2.1.1. are:

> **F63** To limit moisture condensation.
>
> **OH1** Health – Indoor Conditions

The "area of performance" can be simply stated:

> "The *alternative solution* must limit moisture condensation [F63] for reasons of Health – Indoor Conditions[OH1]."

You will be able to practice describing "areas of performance" in more detail in Module 10.

Why Are Objectives Listed First in the Code But Functional Statements Are First in the Pairs?

Objectives are listed before *functional statements* in the Code since they are the foundation for the objective-based format of the Code. *Functional statements* are listed first in the Attribution Tables to improve legibility and save space.

The evaluation of *alternative solutions* works best if the *functional statements* are stated first, followed by the *objective*. However, the order of *objectives* and *functional statements* is ultimately a matter of personal preference and is not important in the overall evaluation.

Why Are There So Many Pairs?

Often there can be more than one reason for a certain building function. For example, the requirement for thermal breaks in doors has one functional statement: F63, to limit moisture condensation. There are three *objectives* which means there are three reasons for providing thermal breaks:

OH1.1 → to reduce risk of illness caused by inadequate indoor air quality
OH1.2 → to reduce risk of illness caused by inadequate thermal comfort
OS2.3 → to reduce risk of injury caused by damage to or deterioration of building elements

If the *objective* for structural safety were missing, the evaluation may not consider how the thermal break would affect structural safety. Thermal breaks that are adequate for indoor air quality and thermal comfort may not be adequate for structural safety. By having all three *objectives*, or reasons, for the function, all issues will be considered in the evaluation of the *alternative solution*.

Functional statements and objectives are required to be in linked pairs to fully explain the reasons for a building function.

STOP

Exercise 5-5 (Guided)

Identify and write the pairs of *functional statements* and *objectives* that derive the "areas of performance" linked to the acceptable solution, requirement of Division B, Sentence 9.6.2.1.(1) to have a front entrance door for a dwelling unit.

Process to arrive at the answer:

Step 1: Find the applicable Division B requirement.

- Div. B, Sentence 9.6.2.1.(1) Doors for Dwelling Units states: *A door shall be provided at each entrance to a dwelling unit....*

Step 2: Go to Supplementary Standard SA-1, Table 9.
- The entry for Div. B, Sentence 9.6.2.1.(1) states:

[F40, F42, F61 – OH1.1] [F51, F54 – OH1.2]
[F42 - OH2.5] [F131 – OR2] and [F42, F61 – OS2.3] applies to portion of Code text: "at each entrance to a dwelling unit" The pair [F101 – OH6] applies to portion of Code text: "to each room containing a water closet" and is not applicable in this case.

Step 3: Make the pairs of *functional statements* and *objectives* by matching up the pairs in each set of square brackets.

From Table 9 of SA-1	**Pairs**
[F40, F42, F61 – OH1.1]	F40 – OH1.1
	F42 – OH1.1
	F61 – OH1.1
[F51, F54 - OH1.2]	F51 – OH1.2
	F54 – OH1.2

[F42 – OH2.5] [F131 – OR2] [F42, F61 – OS2.3], applies to portion of Code text: "at each entrance to a dwelling"

F42 – OH2.5
F131 – OR2
F42 – OS2.3
F 61 – OS2.3

Step 4: Describe in plain language what the *alternative solution* needs to do at least as well as the Division B *acceptable solution* and why.

Referring to Division A, Tables 3.2.1.1. and 2.2.1.1., do as many examples as time permits using the format "The alternative solution must <*functional statement*> for <*objective*> reasons".

Example for "area of performance" [F42 – OH2.5]:

- The *alternative solution* must resist the entry of vermin and insects [F42] for *Health* – Sanitation reasons [OH2.5].

Summary

- A proposed *alternative solution* is for any proposed product, material, component, design, system, equipment or procedure to be used as a substitute to a Division B provision (*acceptable solution*).

- A designer or owner, not the official, is responsible for proposing an *alternative solution*.

- The person having jurisdiction evaluates the proposed *alternative solution*.

- Using *alternative solutions* is one of the two possible methods to comply with the Code.

- *Alternative solutions* must provide at least the level of performance (minimum/lowest) required by the Division B provisions.

- Each Div. B requirement is linked to at least one *objective* and *functional statement* in pair. These pairs of *objectives* and *functional statements* derive the "areas of performance" provided by the *acceptable solutions* of Division B and required of the *alternative solution*.

- Top-level categories of objectives of Ontario's 2006 Building Code are:

OS	Safety
OH	Health
OA	Accessibility
OP	Fire, Structural, Water and Sewage Protection of Buildings
OR	Resource Conservation
OE	Environmental Integrity
OC	Conservation of Buildings

- *Functional statements* describe the functions that a building or an element of a building must perform to fulfill the *objectives*.

- *Functional statements* and *objectives* are required to be in pairs to fully explain the reasons for a building function.

- **The "area of performance" of the *alternative solution* is derived from the pairs of *functional statements* and *objectives* linked to the *acceptable solutions* (technical requirements/provisions of Division B. The linked pairs describe what needs to be done (the function) and why (the *objective*).**

In simple terms, the "areas *of performance" tell you what to evaluate for a* proposed *alternative solution.*

Self-Assessment

As a result of this module, I am able to:

- ☐ Describe an *alternative solution* and give examples
- ☐ Describe how *alternative solutions* compare to equivalents
- ☐ Identify the top-level categories of *objectives* from memory
- ☐ Use the Attribution Tables to find pairs of *objectives* and *functional statements* linked to the *acceptable solutions* (technical requirements/provisions) of Division B
- ☐ Identify the "areas of performance" to be evaluated for an *alternative solution*

Where Do We Go From Here?

We will wrap up the first half of the course with case studies that use Division B (*acceptable solutions*) and introduce *alternative solutions.*

END OF MODULE 5

Module 6

Confirming Method of Compliance, Case Studies

Introduction

Up to this point, you have learned about the organization of the 2006 Code in three Divisions and how to obtain Code compliance using either the *acceptable solutions* of Division B or *alternative solutions*. This module will recapitulate this information and you will have a chance to confirm the method of compliance in case studies.

Learning Outcomes

At this point in the course, you should be able to:

- Find familiar content in the reorganized 2006 Code
- Identify and locate key features of Ontario's first Objective-Based Code
- Apply the 2006 Code using Division B provisions
- Recognize that an *alternative solution* can be used as a compliance option

Summary of Key Points

1. Organization

The 2006 Code is organized into 3 Divisions.
The three Parts of Division A contain compliance and application provisions and the *objectives* and *functional statements*. Division B contains the *acceptable solutions* in 12 Parts (the technical provisions of the 1997 Code). The four Parts of Division C contain administrative provisions which were found in Part 2 of the 1997 Code and the transition, revocation and commencement provisions which were in Part 12 of the previous code.

When writing Code references, include the Division reference, e.g. Division B, Sentence 3.4.5.6.(1). In the text of the Code, if a provision contains a reference to another provision but no Division is specified, both provisions are in the same Division.

2. Key features of the Objective-Based Code

Key features of the Objective-Based Code (that were not in the 1997 Code) are:

- *Objectives*
- *Functional statements*
- Compliance options [Div. A, 1.2.1.1.(1)]

Division B is deemed to satisfy the *objectives* of the Code. Division B requirements are linked to at least a pair of one *objective* and one *functional statement.*

3. Apply the Code Using Division B Acceptable Solutions

Applying the Code using the *acceptable solutions* of Division B is very similar to the process followed using the 1997 Code. It is one of two methods that can be used to achieve compliance with the 2006 Code. The steps to apply the 2006 Code using *acceptable solutions* are (see the flowchart in Module 3):

1. Receive application conforming to Div. C, Clauses 1.3.1.3.(5)(a) to (c)

2. Confirm compliance with other Division C provisions

3. Confirm method of compliance with Div. A, Clause 1.2.1.1.(1)(a), *acceptable solutions*

4a. Confirm compliance with applicable Division B provisions

5a. (Optional) Consult *Objectives* and *Functional statements* of Division A

Final Step: Acceptance or refusal and document retention

4. Applying the Code Using Alternative Solutions

Applying the Code using *alternative solutions* is the other method to achieve compliance with the Code.

Alternative solutions must meet the minimum level of performance established by Division B in respect of the "areas of performance" of the *objectives* and *functional statements.*

Case Studies

The case studies in this module will give you an opportunity to apply Ontario's 2006 Objective-Based Code.

The case studies are intended to provide practice in using the 2006 Code and do not concentrate on the detailed technical evaluation of the issues. However, the case studies do include technical issues in order to make them more realistic.

Record Code references as much as possible when you are writing your answers to the questions below. Use the suggested process introduced in Module 3.

Case Study 6-1

Scenario

A permit has been issued for the construction of a 4-storey 80 unit apartment building. The building inspector notices that a new type of smoke alarm with visual signals for the hearing impaired is being installed in each unit. The building is not intended for use primarily by persons with hearing impairment. Consider the tasks and answer the questions that follow.

Tasks

- Inspector's assessment of the situation and action.
- Identification of applicable Div. B provisions and any related provisions that could be considered.
- Optional steps to clarify situation.
- Identify options of owner in achieving compliance if the smoke alarms do not comply with Div. B.

1. If you were the inspector, what action would you take?

____

____

____

____

____

____

2. Step 4a, what Div. B Code provisions are applicable? Are there related provisions that must be considered?

3. Optional Step 5a, identify the pairs of *objectives* and *functional statements* linked to the applicable provisions.

4. Optional Step 5a, state the "areas of performance" in words using the format "The solution must <*functional statement*> for <*objective*> reasons".

5. What options are available to the owner if the smoke alarms do not comply with Division B, Sentences 3.2.4.21.(1) and (7)?

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Case Study 6-2

Scenario

A person has applied for a building permit to construct a carport addition that will be attached to a house in an area that has a specified snow load of 2.0 kPa. The design includes the use of:

- Roof Joists: SPF, No.1 Grade, 38 x 184 mm at 400 mm o.c. that span 4 metres

The permit application and drawings have been verified to meet Division C requirements, in Steps 1 and 2. The applicant has not submitted any documentation under Div. C, Section 2.1.

Task

- Carry out the plans review of the roof joists.

1. Step 3, confirm the intended method of compliance.

____

____

2. Step 4a, what Div. B Code provisions are applicable? Is there compliance? Are there related provisions that must be considered?

3. Optional Step 5a, in this case, is there a need to consult the *objectives* and *functional statements* and state the "area of performance" in words?

4. If the proposed design does not comply with the provisions of Division B, identify the contraventions so that the CBO may officially inform the applicant of the reasons for the refusal of the permit. [BCA Subsection 8.-(2.3) and Code Division C, Clause 1.3.1.3.(1)(b)]

5. Considering the "unofficial process" and before proceeding to the Final Step, acceptance or refusal and documentation retention, is there an easy solution, other than an *alternative solution*, that could fix this problem?

Case Study 6-3

Scenario

For a Part 9 dwelling unit, a homeowner submits a design for a one-storey addition that will be supported on concrete piers. The design proposes to fully enclose the crawl space and omit an access opening. The Plans Examiner confirmed over the telephone that the applicant does not want to install an access opening because of a concern that children would be able to access the crawl space. Documentation under Div. C, Section 2.1. has not been submitted.

Task

You are the Plans Examiner, follow the "a" path of the proposed flow chart for applying the 2006 Code, consider the homeowner's proposal and familiarize yourself with the provisions for crawl spaces under Division B of the Code.

1. Step 3, confirm the intended method of compliance.

2. Step 4a, what Div. B Code provisions are applicable? Is there compliance? Are there related provisions that must be considered?

3. Optional Step 5a, identify the pairs of *objectives* and *functional statements* linked (attributed) to the applicable provisions.

4. Optional Step 5a, state the "area of performance in words using the format "The solution must <*functional statement*> for <*objective*> reasons.

5. Now that you have studied the situation, how can the design of the crawl space access opening be made to comply with Div. A, Article 1.2.1.1.?

Case Study 6-4

Scenario

For a Part 3 building, an Architect is proposing to use an innovative rated floor assembly that has undergone fire endurance testing in Europe. The floor assembly has not been tested to CAN/ULC-S101-M; and, is not identified in Supplementary Standard SB-2. The proposed floor assembly meets all other code requirements. The Architect has submitted documentation under Division C, Section 2.1.

Tasks

- You are the Plans Examiner, get familiar with the proposal of the Architect by following the "b" path of the proposed flow chart for applying the 2006 Code.
- For purposes of this exercise, do not consult "Documentation of *Alternative Solutions*" under Division C, Section 2.1..
- Identify the method of compliance that the Architect has selected to comply with Division B.

1. Step 3, confirm the method of compliance that has been selected by the Architect to comply with Division B.

2. Step 4b, what Division B Code provisions are applicable for the determination of a fire-resistance rating in a Part 3 building?

3. For purposes of this exercise, skip Step 5b, check databases or previously approved *alternative solutions*.
4. Step 6b, confirm applicable pairs of *objectives* and *functional statements* attributed (linked to) the applicable Division B provisions.

5. Optional at Step 6b, state the "area of performance" in words using the format "The solution must <functional statement> for <objective> reasons.

CONCLUSION

For the *alternative solution* to be accepted, the documentation must convince the person having jurisdiction that it will achieve the level of performance required by the applicable Division B provisions (*acceptable solution*). Level of performance will be dealt with in Module 11.

Case Study 6-5

Scenario

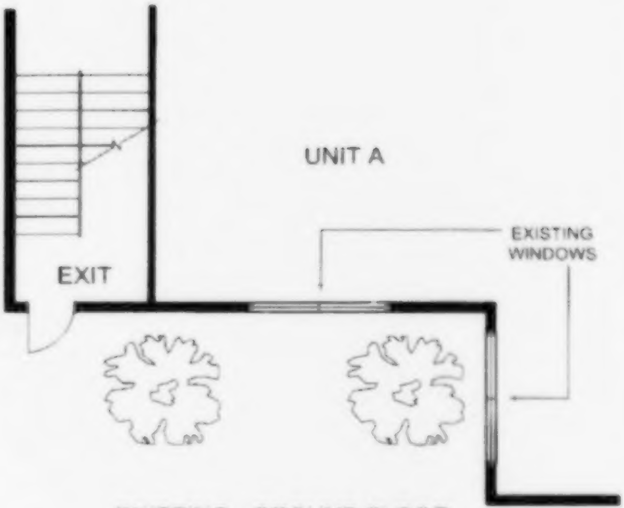
A two-storey office building with a building area of 750 m^2 is being renovated. One of the interior exit stairs serving the second floor is being removed and will be replaced with an unenclosed exterior exit stair that will comply with the dimensional requirements of Division B for an exit stairway (it is not a fire escape). The design does not indicate any modifications to the two existing windows on the ground floor that expose the new unenclosed exterior exit stair. The building is unsprinklered.

Task

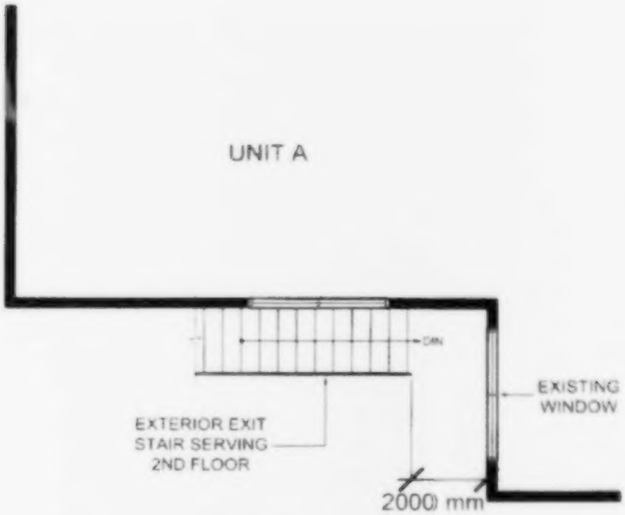
You are the Plans Examiner, assess the proposal of the designer by following the "a" path of the proposed flow chart for applying the 2006 Code because the application did not include any documentation under Div. C, Section 2.1.

1. Step 3, confirm the intended method of compliance.

2. Step 4a, what Div. B Code provisions are applicable? Is there compliance? Are there related provisions that must be considered?



EXISTING - GROUND FLOOR



PROPOSED

3. Optional Step 5a, identify the pairs of *objectives* and *functional statements* linked (attributed) to the applicable provisions.

4. Optional at Step 5a, state the "area of performance" in words using the format "The solution must <functional statement> for <objective> reasons.

5. From the following design options, identify the designs that could comply with Division B, *acceptable solutions* and those that would require assessment, under the "b" path of flow chart for applying the 2006 Code, as an *alternative solution*.

A. Remove the window openings and reconstruct the exterior wall assembly

B. Install wired glass or glass block in the window openings

C. Install sprinklers in the entire building

D. Install BMEC Authorized window sprinkler systems in the window openings or comply with Div. B. Article 3.1.8.18., Sprinkler Protected Glazed Wall Assembly

E. Install fire shutters, in accordance with NFPA 80, in the window openings

Where Do We Go From Here?

You have learned to identify when to evaluate proposals in accordance with Division A compliance options under Clause 1.2.1.1.(1)(a), *acceptable solutions* or Clause 1.2.1.1.(1)(b), *alternative solutions*. Modules 7 through 12 concentrate on the process to evaluate proposed *alternative solutions*. Module 12 is devoted to case studies of proposed *alternative solutions* that will bring together all of the course material.

END OF MODULE 6

SYNOPSIS OF INFORMATION PRESENTED TO THIS POINT

1. The 2006 Objective-Based Code contains 3 divisions:

Division A	- deals with Methods of Compliance with Division B, *Objectives* and *Functional Statements*
Division B	- contains the technical requirements (not unlike the 1997 version of the Ontario Building Code)
Division C	- contains most of the Administrative Requirements.

NOTA BENE: There are neither *objectives* nor *functional statements* for the provisions of Division A and those of Division C.

2. The 2006 Objective-Based Code outlines:

   a. the technical requirements

   b. the *objectives* that the technical requirements are to achieve. This allows for the use of *alternative solutions* to achieve the same *objectives* as the Code provides in Division B, *acceptable solutions*.

3. Every technical requirement of Division B is linked to at least one *objective*; or one may also say that every technical requirement in the Code achieves a particular *objective* or goal.

4. Every technical requirement must also perform a function to achieve a particular *objective*. This means that every technical requirement is linked to at least one *functional statement*.

5. Keeping in mind the above two statements, every technical requirement is linked to at least one *functional statement* and one *objective* called a pair.

NEW INFORMATION

MANDATORY PART OF CODE

Addressing the **WHY** for the technical requirement

OBJECTIVES
- Goal that the requirement is intended to achieve
(General in nature)

Addresses **WHAT** the *objective* is to accomplish

FUNCTIONAL STATEMENTS
- Describes the function that the building element must perform in order to fulfil the intended *objective*.

6. **COMPLIANCE WITH DIVISION B CAN BE ACHIEVED BY**:

   a. **Complying with Division B** requirements (*Acceptable Solutions*). This method is "business as usual" as was the case with all previous editions of the Building Code.

   b. **Using an** Applicant supplied **Alternative Solution** that is accepted by the person having jurisdiction.

      1) The *Alternative Solution* must achieve the "**level of performance**" required of the Division B requirement.

      2) This level of performance must be achieved in the "**area of performance**"established by the linked pairs of *functional statements* and *objectives* attributed to that particular Division B requirement.

7. "AREAS OF PERFORMANCE"

   a. The "*Area of Performance*" is defined by each linked pair of *functional statement* and *objective* that is attributed to the Division B requirement. [FS - O] for example, [F21 - OS1.2] is linked to the provisions of Division B, Sentence 9.20.3.1.(3).

      The Functional Statement indicates what the provision is intended to do while the Objective expresses why that particular requirement is established.

Module 7

Alternative Solutions

Introduction

Up to this point, you have learned:

- to apply the 2006 Code using *acceptable solutions* (Division B), and
- the basis for *alternative solutions*.

The remaining modules in this course deal with *alternative solutions* and the process to evaluate *alternative solutions*.

An evaluation process for compliance with Division B was introduced in Module 3. This module covers the sample process for the evaluation of proposed *alternative solutions*.

The evaluation process suggested in Modules 9 through 12 represents only one example of several possible processes. A principal authority may modify the process to suit local needs. As well, proposed *alternative solutions* can be very different from each other and the evaluation process may need to be modified to suit the situation.

This module covers the first five steps of the sample process. Modules 8, 9 and 10 will elaborate on the next seven steps. You will be able to apply the sample process to case studies in Module 11 (guided) and Module 12.

Learning Outcomes

At the end of this module, you will be able to:

- Describe the first five steps of the flow chart for the evaluation of a proposed *alternative solution*.
- Describe submission requirements for a proposed *alternative solution*.

The Process for Evaluating an Alternative Solution

A detailed flow chart is presented on the next page. Keep it available for reference.

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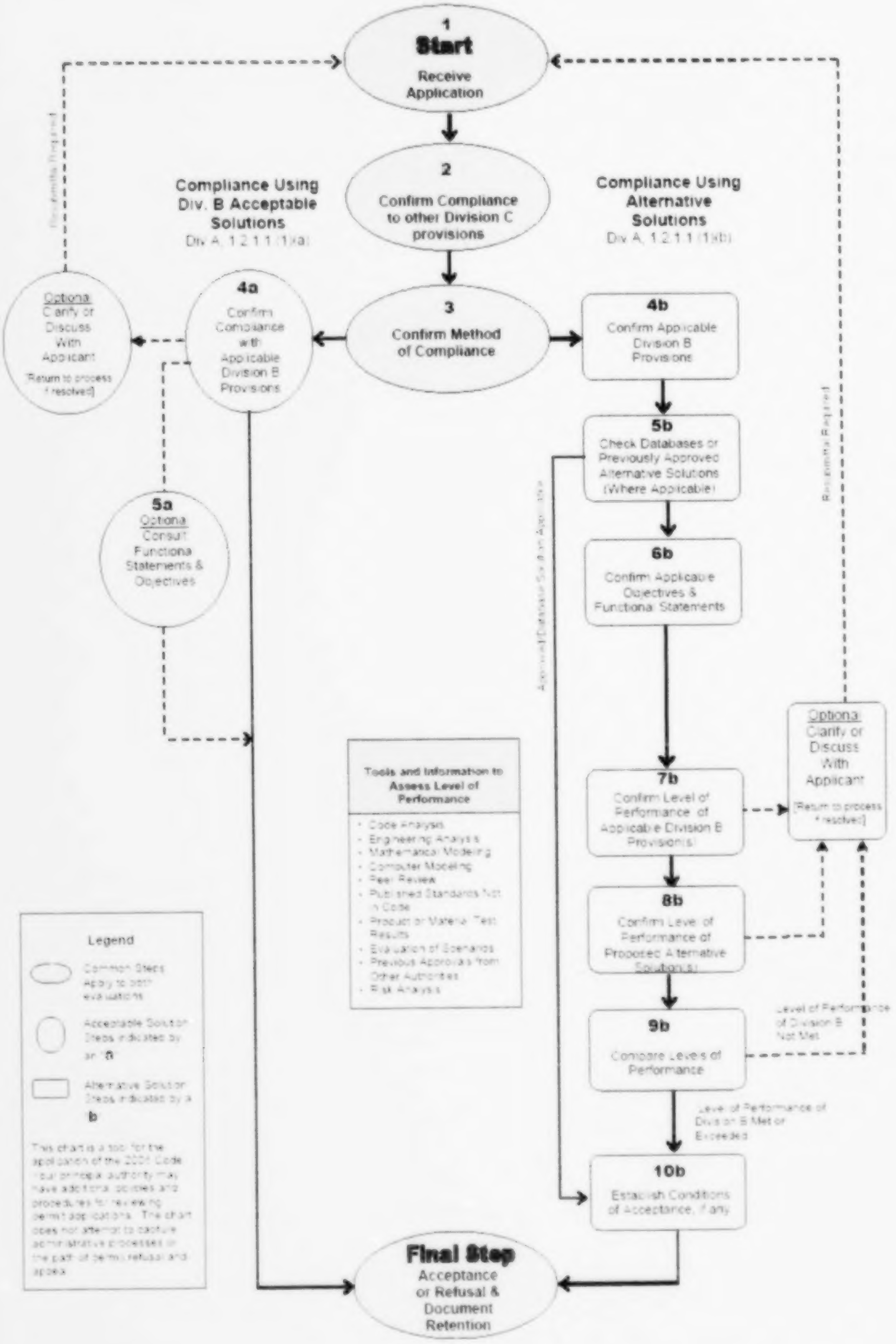
Applying the 2006 Code


1
Start
Receive Application
Resubmittal Required
2
Confirm Compliance to other Division C provisions
Compliance Using Div. B Acceptable Solutions
Div A, 1.2.1.1.(1)(a)
Compliance Using Alternative Solutions
Div A, 1.2.1.1.(1)(b)
Optional
Clarify or Discuss With Applicant
[Return to process if resolved]
4a
Confirm Compliance with Applicable Division B Provisions
3
Confirm Method of Compliance
4b
Confirm Applicable Division B Provisions
5b
Check Databases or Previously Approved Alternative Solutions (Where Applicable)
Resubmittal Required
Approved Database Solution Applicable
5a
Optional
Consult Functional Statements & Objectives
6b
Confirm Applicable Objectives & Functional Statements
7b
Confirm Level of Performance of Applicable Division B Provision(s)
Optional
Clarify or Discuss With Applicant
[Return to process if resolved]
8b
Confirm Level of Performance of Proposed Alternative Solution(s)
9b
Compare Levels of Performance
Level of Performance of Division B Not Met
Level of Performance of Division B Met or Exceeded
10b
Establish Conditions of Acceptance, if any
Final Step
Acceptance or Refusal & Document Retention
Legend
Common Steps Apply to both evaluations
Acceptable Solution Steps indicated by an "a"
Alternative Solution Steps indicated by a "b"

Tools and Information to Assess Level of Performance

- Code Analysis
- Engineering Analysis
- Mathematical Modeling
- Computer Modeling
- Peer Review
- Published Standards Not in Code
- Product or Material Test Results
- Evaluation of Scenarios
- Previous Approvals from Other Authorities
- Risk Analysis

This chart is a tool for the application of the 2006 Code. Your principal authority may have additional policies and procedures for reviewing permit applications. The chart does not attempt to capture administrative processes or the path of permit refusal and appeal.

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The sample process flow chart can be used for both *acceptable solutions* and *alternative solutions*. Steps 1 to 3 and the final step are shared:

Step 1. Receive Application Conforming to Div. C, Clauses 1.3.1.3.(5)(a) to (e)

Step 2. Confirm Compliance with other Division C provisions

Step 3. Confirm Method of Compliance Under Div. A, Clause 1.2.1.1.(1)(a) [acceptable solutions of Division B] or 1.2.1.1.(1)(b) [alternative solutions]

Final Step: Acceptance or Refusal and Document Retention

Steps 1-3 and the final step apply to both methods of achieving compliance.

The steps below are unique to the evaluation of *alternative solutions*. They are indicated by a "b" after the number. This corresponds to the compliance provision for *alternative solutions* – Div. A, Clause **1.2.1.1.(1)(b):**

Step 4b	**Confirm Applicable Division B Provisions**
Step 5b	**Check Databases (Optional)**
Step 6b	**Confirm Applicable Objectives and Functional Statements**
Step 7b	**Confirm Level of Performance of Applicable Division B Provisions**
Step 8b	**Confirm Level of Performance of Proposed Alternative Solutions**
Step 9b	**Compare Levels of Performance**
Step 10b	**Establish Conditions of Acceptance if any**
	Acceptance or Refusal and Document Retention

This procedure can be used to evaluate a proposal for a specific building. Your principal authority may have additional policies relating to the evaluation of *alternative solutions* proposed for repeated use, or *alternative solutions* previously approved in other principal authorities.

After using the procedure, you may simplify some of the steps.

Some projects will include only one feature that must be evaluated as an *alternative solution*. Other projects may include many proposed *alternative solutions* that will have to be evaluated simultaneously.

Roles and Responsibilities

The person having jurisdiction is responsible for the assessment and to confirm that the *alternative solution* meets the requirements of Div. A, Clause 1.2.1.1.(1)(b). The word "confirm" is used in the process for actions by the person having jurisdiction.

The applicant is responsible for providing a complete Analysis and evaluation (documentation) of the proposed *alternative solution*.

Facilitator / Self-Study, Participant Note:

In this manual, the person having jurisdiction is the chief building official (CBO), the Inspector, the registered code agency (RCA) or person authorized by the RCA, as the case may be, who carries out the plans review activity

The person having jurisdiction and the applicant may need to discuss the Analysis during the process. Some simple proposals may not require any discussion with the applicant. However, complex proposed *alternative solutions* might require clarification or discussion with the applicant.

The person having jurisdiction is responsible for the review of the submission prepared by others, and to confirm that the alternative solution complies with the Code or refuse same if in his/her opinion the alternative solution does not achieve the required level of performance.

Pre-application Stage

There may be discussion between the person having jurisdiction and the applicant before the actual application is submitted. The extent of this discussion will vary between principal authorities.

1
Start
Receive Application

Applying the Process

Step 1 – Receive Application Conforming to Division C, Clauses 1.3.1.3.(5)(a) to (e)

The evaluation process starts with a cursory review of the application by the person having jurisdiction. This would include checking that:

- the appropriate application form has been completed.

  [permit under Section 8 or 10 of BCA]

- the application is accompanied by schedules, plans and specifications; and,

  [information checked against Div. C, Article 1.3.1.3. in general and Sentences 1.3.1.3.(5) to (9) in particular]

- the fees payable on application are attached.

  [By-law under BCA Clause 7.-(1)(c)]

STOP

Exercise 7-1

Almost every permit application includes supporting documentation upon which the issuance of a permit will be based. Supporting documentation typically includes drawings and specifications.

In your experience, what other types of documentation may be required to be submitted as part of a building permit application?

The purpose of this exercise is to make you think about the requirements of your Building By-law enacted under the authority of Section 7 of the *Building Code Act*, and Div. C, Article 1.3.1.3. of the Code.

Some of the documentation submitted may be in support of the proposed design and in addition to what is prescribed to accompany an application.

Specific documentation prescribed in Division C, Part 2 must also accompany the submission of a proposed *alternative solution*. In Step 2, you will confirm that the required documentation has been submitted.

2
Confirm Compliance to Other Division C Provisions

Step 2 – Confirm Compliance with other Division C Provisions

Step 2 is a quick check to verify that the submitted documentation meets Division C, Part 2. A detailed review of the content of the submitted information will take place in later steps.

In Step 2 of the evaluation of alternative solutions, check the submission against the requirements of Division C.

Div. C, Section 2.1.1., "Documentation of *Alternative Solutions*", requires that the submission include documentation (which we will call a Code Analysis) to support a proposed *alternative solution*.

The required (documentation) Code Analysis must:

1. identify the applicable *objectives*, *functional statements* and *acceptable solutions*,

   [OBC Div. C, Clause 2.1.1.1.(1)(a)]

2. establish on the basis of past performance, tests described in Div. C, Article 2.1.1.2., or other evaluation that the proposed *alternative solution* will achieve the level of performance required under Div. B, by way of Div. A, Article 1.2.1.1.,

   [OBC Div. C, Clause 2.1.1.1.(1)(b)]

3. include information about relevant assumptions, limiting or restricting factors, testing procedures, studies or building performance parameters, including any commissioning, operational and maintenance requirements; and,

   [OBC Div. C, Sentence 2.1.1.1.(2)]

4. identify the person(s) taking responsibility for the design of the *alternative solution*, by way of Schedule 1 in the case of a permit under Section 8 of the BCA and by means specified by the principal authority in the case of an application for a permit under Section 10 of the *Building Code Act* and one submitted by an Architect.

   [BCA Subsection 15.11-(5) and OBC Div. C Section 3.2.]

1. Code Analysis (documentation) for Proposed Alternative Solutions

A detailed review of the content of the Code Analysis is not required in this step, just a quick verification that all required elements have been included.

To satisfy Div. C, Clauses 2.1.1.1.(1)(a) and (b) and Sentence 2.1.1.1.(2), the following information must be included in a Code Analysis (documentation):

a. Identification of the applicable Division B provisions.

b. Identification of the applicable *objectives* and *functional statements*.

c. An evaluation of the level of performance of the applicable Division B provisions.

d. An evaluation of the level of performance of the proposed *alternative solution*.

e. Identification of any assumptions, limiting or restricting factors.

f. Identification of testing procedures, engineering studies, or building performance parameters. This could include any of the following:
    - test results
    - calculations
    - computer modeling
    - fire scenarios
    - design fire documentation
    - evidence of successful performance

All information in the Code Analysis must be in sufficient detail to convey the design intent and to support the validity, accuracy, relevance and precision of the Code Analysis.

2. Special Maintenance or Operation Requirements for Proposed Alternative Solutions

Division B is based on general uses and characteristics of buildings. Designs using *alternative solutions* should take into account the specific use and characteristics of the building or facility.

However, this means that changes to these specific uses or characteristics may void the *alternative solution*. And so there is an added obligation to restrict the use and characteristics of the building to those that formed the basis of the evaluation, both now and in the future.

Information concerning any special maintenance or operation requirements that are essential to the *alternative solution* must be submitted. These restrictions could include defining and posting occupant load, identifying permitted uses, limiting fuel load (combustible content), commissioning requirements, etc….

3. Qualification of the Person(s) Taking Responsibility for the Design of Proposed Alternative Solutions

Except for Architects, for permits under Section 8 of the BCA, the qualification of the person(s) taking responsibility for the design of the *alternative solution* is provided by Schedule 1 attached to the prescribed application. Architects would need to provide their qualification under the *Architects Act*, Building Code Designation System.

Designer qualifications under Div. C, Section 3.2. and Section 1.2. for those buildings that require design and general review by an architect, professional engineer or both are the minimum required for the submission of an *alternative solutions*.

Summary of Submission Documentation Requirements

1. **Code Analysis**
2. **Special maintenance or operation requirements**
3. **Qualification of the person(s) taking responsibility for the design of the alternative solution**

STOP

Sample Checklist for Submission Information

A principal authority may develop a submission form for proposed *alternative solutions* or a checklist for reviewing the submission in Step 2.

A checklist would include:

- mandatory items from Division C (items 1 to 5 in the sample checklist);
- optional items that may help in the review (items 6 to 9 in the sample checklist).

Building By-law Update

The portion of your Building By-law, enacted under the authority of Section 7 of the *Building Code Act* that dealt with equivalents will need to be repealed and replaced with provisions for dealing with *alternative solutions*.

Sample Checklist for Submission Information For Use by a Principal Authority/RCA

(based on Division C, Section 2.1.)

Required for Submission of a Proposed Alternative Solution			**Submitted (yes/no)**
1	A description of the proposed *alternative solution* [Div. A, 1.2.1.1.(1)(b)]		
2	Proponent's name, company, address, contact information		
3	Designer's qualification appear on Schedule 1. When proponent is an Architect, indicate BCDS qualifications under the *Architect's Act*		
4	Code Analysis (documentation under Div. C, Article 2.1.1.1.) establish on the basis of past performance, tests described in Div. C Article 2.1.1.2., or other evaluation that the proposed *alternative solution* will achieve the level of performance required under Div. B, by way of Div. A, Article 1.2.1.1.		
	a	Identification of applicable Division B provisions (*acceptable solutions*)	
	b	Identification of applicable linked pairs of *objectives* and *functional statements*	
	c	An evaluation of the level of performance of applicable Division B provisions	
	d	An evaluation of the level of performance of the proposed *alternative solution*	
	e	Identification of any assumptions, limiting or restricting factors	
	f	Identification of testing procedures, engineering studies, building performance parameters etc … to support the assessment for compliance	
5	Information concerning any special maintenance or operation requirements, including commissioning, necessary for the integrity of the *alternative solution* after construction is complete		
Optional Items That Would be Helpful in the Review			
6	A list of submitted documents: These could include a concept report, calculations, fire modelling, test reports, precedents, fire scenario evaluation, alternate Codes and standards, drawings, etc.		
7	Reason for the proposed *alternative solution*		
8	A list of applicable sections of referenced documents (standards)		
9	Résumé of designer with details of qualifications		
10	Other: (specify)		

Additional Information to Support a Proposed Alternative Solution

The 1997 Code did not contain specific submission requirements to demonstrate equivalency other than "sufficient evidence" to convince the CBO or RCA having jurisdiction that the proposed equivalent provided the level of performance required by the Code. Where equivalents were permitted the CBO or RCA having jurisdiction used their own judgment to decide if the supporting evidence was sufficient.

Since limited tools were available for the evaluation of an equivalent, some principal authorities established their own policies and procedures for evaluating an equivalent. Some jurisdictions may have permitted equivalents only in certain situations such as for the preservation of heritage buildings or to accommodate construction difficulties. Some jurisdictions may have required extra measures or conditions to compensate for not meeting the Code requirements.

While these policies and administrative procedures may continue to be in effect in some principal authorities, they are outside the scope of the 2006 Code and this training material.

The 2006 Code and its previous editions do not require that the proponent provide a specific reason for wanting their proposed *alternative solution* to be considered. Typical reasons relate to cost, construction difficulties, heritage features, or architectural design.

Subsections 9.-(2) and (3) of the *Building Code Act* empowered the CBO or RCA having jurisdiction to impose conditions on the use of an equivalent material, system and building design, including conditions relating to the construction, operation and maintenance of the building.

Compared to the 1997 Code, more tools are provided in the 2006 edition to help the staff of principal authorities and designers define the level of performance of the *acceptable solution* and that of the *alternative solution* and should lead to greater clarity and confidence. Level of performance is discussed in Module 11.

STOP

Exercise 7-2

A proposed *alternative solution* deals with the location of exits in an office building. The proposed design does not comply with applicable Division B provisions because the travel distances are too long.

The purpose of this exercise is to become familiar with Division C requirements regarding the submission of documentation for a proposed *alternative solution*.

1. Read the list of items below and confirm whether they are required items (documentation) for the submission of a proposed *alternative solution*.

Required	Not Required	Items (documentation) to be Submitted for a Proposed *Alternative Solution*
________	________	A. Contact information of the proponent.
________	________	B. Letter outlining conditions of building operation that are required to be maintained for the integrity of the *alternative solution*.
________	________	C. Identification of the applicable Division B provisions.
________	________	D. Letter from all current tenants in support of the design.
________	________	E. Identification of the applicable *objectives* and *functional statements*.
________	________	F. Evaluation of the level of performance of the proposed *alternative solution*.
________	________	G. The timed egress Analysis including assumptions and limitations.
________	________	H. Description of the reasons for the *alternative solution*.

2. List any missing documentation.

Summary of Step 2

Step 2 ensures that the information required for the evaluation of an *alternative solution* has been submitted and that the application is complete. [Div. C. Sentences 1.3.1.3.(5) to (9)] The plans review and Analysis of the information in the documents is done later.

- If any required information is missing, the evaluation cannot proceed and a resubmission should be requested. Return to Step 1.
- If the required information has been submitted, proceed to Step 3.

3
Confirm Method of Compliance

Step 3 – Confirm Proposed Method of Compliance Under Division A, Clause 1.2.1.1.(1)(a) or (b).

At this Step, there are two choices:

1. **Compliance using Division B:** The applicant does not propose any *alternative solutions* and therefore intends to achieve compliance using acceptable solutions of Division B. [Div. A. Clause 1.2.1.1.(1)(a)]
    - ➢ Proceed to Step 4a as shown in Module 3, the plans review to verify for compliance with the technical requirements of Division B.
2. **Compliance using alternative solutions:** The applicant proposes an *alternative solution* for one or more design elements at Step 1, and therefore intends to achieve compliance using *alternative solutions* [Div. A. Clause 1.2.1.1.(1)(b)].

- Proceed to Step 4b discussed next.

4b
Confirm Applicable Division B Provisions

Step 4b – Confirm Applicable Division B Provisions

Division C, Clause 2.1.1.1.(1)(b), the Code Analysis (documentation) to establish that the proposed *alternative solution* will provide the level of performance required by Division B. This requires the applicant to identify the ***applicable Division B provisions*** in the submission. It is the responsibility of the person having jurisdiction to verify and confirm that these are correct.

What Does "Applicable" Mean?

The word applicable is used because not all provisions in Division B will apply to the evaluation of a particular *alternative solution.* More specifically, when an *alternative solution* does not comply with the Code under the compliance option stated in Div. A, Clause 1.2.1.1.(1)(a), you must first identify the Code provision(s) that is not complied with. These are the applicable Division B provisions.

For example, an *alternative solution* for an access route for fire department use that has a 110 m dead-end portion with no turnaround facilities.

The applicable Division B provision is Clause 3.2.5.6.(1)(f): *A portion of a roadway or yard provided as a required access route for fire department use shall… have turnaround facilities for any dead-end portion of the access route more than 90 m long….*

An *applicable* Division B provision is a Code requirement that would be satisfied if the design were to comply with an acceptable solution of Division B.

Related Applicable Provisions

Some proposed *alternative solutions* will only have one or two applicable provisions from Division B. Other proposed *alternative solutions* will have several applicable Division B provisions because of related issues.

For example, a proposed *alternative solution* involves exterior sheathing on a house. The applicable provisions will be from Subsection 9.23.16., *Wall Sheathing*. If the wall sheathing also functions to provide bracing, related provisions from Article 9.23.10.2., *Bracing and Lateral Support*, will also be applicable.

ALL of the Code provisions that are related to the proposed *alternative solution* must be identified. These become the "set" of applicable provisions that must be analyzed.

Multiple Design Options or Methods in Division B

What must be done when Division B offers multiple design options for certain elements of a building?

For example, Part 9 offers many choices for roofing materials (asphalt shingles, wood shingles, sheet metal, etc…), for cladding (vinyl siding, stucco, lumber siding, etc…) and for interior finishes (gypsum board, plywood finish, wall tile finish, etc…). There is a specific "set" of Division B provisions for each of these design options.

Similarly, Division B sometimes offers different options that comply with the provision. For example, there are up to four ways to satisfy Sentence 3.3.1.7.(1), *Protection on Floor Areas with a barrier-free path of travel*:

- provide a protected (firefighter's) elevator,
- divide the floor area into 2 fire compartments,
- provide balconies in residential occupancies, or
- sprinkler the building.

Although the various design options or methods provide different levels of performance, **all comply with Division B of the Code**.

To demonstrate that the performance of an *alternative solution* is equivalent to that of applicable Division B provisions, the proposed *alternative solution* must possess the necessary characteristics to perform its intended functions.

The context is important. When a component is part of an overall system, the *objectives* of the entire system must be considered. For example, if an alternative roofing material is proposed, the applicant must demonstrate that the entire roofing assembly will achieve the intended purpose and related functions described in Section 9.26., *Roofing*.

The applicable Division B provisions may thus be at a higher, more general level than Sentences describing a specific design option. One might have to consider provisions at the Article, Subsection, Section level, or in another Section altogether.

The *alternative solution* must perform the function "at least as well as " one of the prescribed options of the provisions of Division B.

Applicable Division B provisions must be identified for every proposed alternative solution.

Where there is more than one design option in Division B, the alternative solution needs to be compared to all code provisions in Division B that address the intended functions of the alternative solution.

STOP

Exercise 7-3 (Guided)

Write the applicable Division B provisions for the following *alternative solutions*. After finishing the exercise, compare your answers with the ones on the next page. Support your answers with Code references.

The purpose of this exercise is to become familiar with the concept of applicable provisions.

	Proposed Alternative Solution	Applicable Division B Provisions
	Example: An exit door that swings opposite to the direction of exit travel.	The requirement that an exit door swing in the direction of exit travel. Code references: 3.4.6.11.(1) or 9.9.6.5.(1).
1	A new smoke alarm that has been tested only to European standards.	
2	Exit stairs with rise and run dimensions steeper than those required by Part 3.	
3	A new foundation system for Part 9 buildings (structural aspects only).	

	Proposed Alternative Solution	Applicable Division B Provisions
1	A new smoke alarm that has been tested only to European standards.	The requirement that a smoke alarm be tested to CAN/ULC-531, "Smoke Alarms." Code references: 3.2.4.21.(1) or 9.10.19.1.(1).
2	Exit stairs with rise and run dimensions steeper than those required by Part 3.	The Part 3 provisions that state minimum run and maximum rise for exit stairs. Since exit capacity is related to the slope of the stairs, the provision dealing with exit capacity factors may also be applicable. Code references: 3.4.6.7.(1) and (2), 3.4.3.2.(1).
3	A new foundation system for Part 9 buildings (structural aspects only).	The "set" of Part 9 provisions that govern the design and construction of **one** of the following systems: • concrete or unit masonry foundation walls, • wood-frame foundation walls, or • flat insulating concrete form foundation walls. Code references: applicable provisions for the selected system in Section 9.15.

5b
Check Databases or
Previously Approved
Alternative Solutions
(Optional)

Facilitator/Participant/Self-Study Note:

The term "database" is used in a generic way to mean BMEC Authorizations, Rulings by the Minister and Rulings by the Building Code Commission on the Building Code Website.

No national registry of provincial or territorial approved *alternative solutions* exists as of 2007.

Some alternative solutions may involve proprietary or listed information or the use of CCMC evaluation reports.

Step 5b - Check Databases or Previously Approved Alternative Solutions (Optional)

BMEC Authorizations and Rulings by the Minister and the Building Code Commission are available on the Building Code Website.

If the database contains a similar case, check its applicability to the proposed *alternative solution(s)* by comparing:

- building size
- building occupancy
- conditions of the approved solution
- other allied factors

The database solution may provide guidance on the evaluation of the proposed *alternative solution* and support the decision of the person having jurisdiction, to allow the use of an *alternative solution*.

The use of a BMEC Authorization or a Ruling by the Minister is not an *alternative solution* and is deemed by Subsection 28.-(5) or 29.-(6) of the *Building Code Act* respectively, not to be a contravention of the building code. Consequently, they are *acceptable solutions*.

At Step 5b:

- ➢ If the database solution is appropriate, proceed to Step 11b to establish conditions of acceptance, if any.
- ➢ If the person having jurisdiction is of the opinion that the use of a database solution is not applicable, proceed to Step 6b.

STOP

Summary

The key points of this module are:

- Flow chart Steps 1 to 3 and the final step apply to both methods of achieving compliance.

- The first five steps in the evaluation of an *alternative solution* are:

  1 Receive Application Conforming to Div. C, Clauses 1.3.1.3.(5)(a) to (e)
  2 Confirm Compliance with other Division C provisions
  3 Confirm Method of Compliance Under Div. A, Clause 1.2.1.1.(1)(a) [acceptable solutions] or (b) [alternative solutions]
  4b Confirm Applicable Division B Provisions
  5b Check Databases (Optional)

- The person having jurisdiction reviews a submission prepared by others, and confirms that it complies with the Code.

- In Step 2 of the evaluation of *alternative solutions*, check the submission requirements stated in Division C.

- Summary of Submission Documentation Requirements

  1. Code Analysis
  2. Special maintenance or operational requirements
  3. Qualification of the person(s) taking responsibility for the design of the *alternative solution*

- Related applicable Division B provisions must also be identified for every proposed *alternative solution*. This is the "set" of Division B provisions that must be analyzed.

- Where there is more than one design option in Division B, the evaluation of an *alternative solution* must consider all Division B provisions related to the intended *objectives* and *functional statements*.

When Division B offers multiple design options for certain elements of a building, the *alternative solution* must perform the function "at least as well as " one of the prescribed options of the provisions of Division B.

Self-Assessment

As a result of this module, I am able to:

- ☐ Describe the first five steps in the evaluation of a proposed *alternative solution*.
- ☐ Describe submission requirements for a proposed *alternative solution*.

Where Do We Go From Here?

The next module deals with Step 6b – Confirm Applicable Objectives and Functional Statements.

END OF MODULE 7

Module 8

Objectives and Functional Statements

Introduction

Technical provisions in Division B are linked to at least a pair of one *objective* and one *functional statement*. In this module, you will gain an understanding of the format and wording of *objectives* and *functional statements*. Then you will learn how they are used together in Step 6b to define the "level of performance" of the "area of performance".

Learning Outcomes

At the end of this module, you will be able to:

- Recognize the format and general content of an *objective*.
- Recognize the format and general content of a *functional statement*.
- Describe how *objectives* and *functional statements* in pairs are used to define level of performance of the "area of performance".
- Identify the level of performance for a particular provision.
- Describe Step 6b of the evaluation process for *alternative solutions*.

Objectives and Functional Statements

Objectives and *functional statements* are linked to each Division B requirement. The *objectives* and *functional statements* are needed when comparing a proposed *alternative solution* to the applicable *acceptable solution* of Division B because they define what needs to be matched and compared.

All Objectives are considered key objectives; however, for **instructional purposes only** 3 levels of objectives will be discussed:

- Top Level Objectives (e.g. OH)
- Second Level Objectives (e.g. OH1)
- Third Level Objectives (e.g. OH1.2)

Module Outline

A. *Objectives* and *Functional Statements*

B. Using *Objectives* and *Functional Statements* in the Evaluation of *Alternative Solutions*

A. Objectives and Functional Statements

Objectives of the Code

Objectives were introduced in Module 3 and revisited in Module 7 when *alternative solutions* were introduced. *Objectives* are located in Division A, Part 2, Table 2.2.1.1.

Objectives are stated in very broad terms. They identify:

- the goals that the Code is intended to achieve,
- the specific aspect of that overall goal that is being addressed,
- who or what is to be protected, and
- the unacceptable risks that the Code addresses, and the causes of the risks.

Each of the characteristics of an *objective* will be described in this module.

Objectives are qualitative, not quantitative, and cannot be used on their own to design a building.

The top-level objectives of the Code are the overall goals that the Code's provisions are intended to achieve.

There are seven top-level, or category of objectives in Ontario's 2006 Objective-Based Building Code:

OS	Safety
OH	Health
OA	Accessibility
OP	Fire, Structural, Water and Sewage Protection of Buildings
OR	Resource Conservation
OE	Environmental Integrity
OC	Conservation of Buildings

Second- and Third-Level Objectives

There are two levels of objectives below most of the top-level *objectives*. Here is an example from the Health *objective*:

Top-Level:	Two letters	OH
Second-Level:	Main objective and a number	OH1
Third-Level:	Second-level objective with a decimal	OH1.2

If you consider Division A, Part 2, Table 2.2.1.1., you will see this structure in the way the *objectives* are laid out. See Figure 10-1 of this manual for an overview of the second- and third-level *objectives* for the Health category of *objectives*.

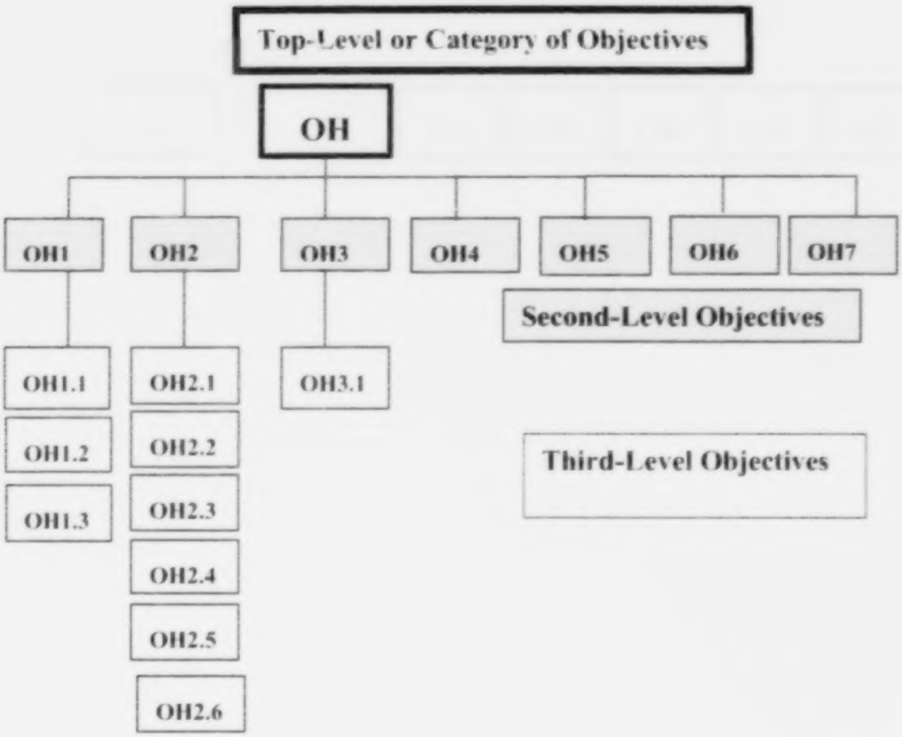


Figure 8-1 OBC Objectives for OH Health

Second-level *objectives* more specifically describe what the Code deals with. For example, the Code deals with these specific **aspects** of Health:

OH1	Indoor Conditions
OH2	Sanitation
OH3	Noise Protection
OH4	Vibration and Deflection Limitation
OH5	Hazardous Substances Containment
OH6	Privacy
OH7	View to the Outdoors

From this list we can conclude that the Code does not deal, for example, with aspects of health resulting from improper food storage.

A second-level objective defines in further detail the aspect of a top-level objective that is being addressed.

The third-level *objectives* define the **cause** of the unacceptable risk. For example, the causes of unacceptable risk of illness related to indoor conditions that are addressed by the Code are:

OH1.1 inadequate indoor air quality
OH1.2 inadequate thermal comfort, and
OH1.3 contact with moisture.

This short list shows that the risk of illness caused by other indoor conditions such as inadequate natural light is not covered by the Code.

A third-level objective describes the specific cause of the risk of injury, illness, impeded access or damage.

Summary

A top-level objective describes the Goal of the Code.
A second-level objective describes the Aspect of the objective.
A third-level objective describes the Cause of the injury, illness, etc.

STOP

Exercise 8-1

Write the titles of the second-level *objectives* and the corresponding number in total of third-level *objectives* for the Safety *objective*.

	Title of Second-Level *Objective* (aspects of Safety)	Number of Third-Level *Objectives*
1. OS1		
2. OS2		
3. OS3		
4. OS4		

Wording and Format of Objectives

Now that you have examined the overall structure of an *objective* and the levels of *objectives*, we will look at the specific wording of *objectives*.

The wording may seem complicated at first, but there is a standard format:

"An *objective* of this Code is to limit the probability that / as a result of the design or construction of a building… / a person in or adjacent to the building … / will be exposed to an unacceptable risk of …/ The risks of … are those caused by …"

In this section, we will break down the wording into these key phrases to understand their meaning.

1. "… To Limit the Probability That …"

"OS Safety
An objective of this Code is to ***limit the probability that*** *…"*

This key phrase, "*… to limit the probability that …*," emphasizes that the Code is meant to limit risk. The Code is not written to eliminate the risk since the Codes cannot totally prevent undesirable things from happening.

For example, the provisions of the Code that address the dimensions of stairs are intended to limit the risk of a person tripping or falling on the stairs. If the Code were to *eliminate* the risk of a person tripping or falling on stairs, stairs would not be permitted by the Code!

Like intent statements, objectives include the wording "*to limit the probability that*" to express that the Code aims to reduce the possibility of an unacceptable event.

2. When Do Objectives Apply?

"OS Safety
An objective of this Code is to limit the probability that, ***as a result of the design or construction of the building*** *…"*

The text of each top-level *objective* indicates the circumstances when an *objective* applies. This often includes the design or construction of a building, and for *objectives* of Environmental Integrity (OE) of a building, its operation and for *objectives* of Conservation of Buildings (OC) its extension, material alteration, repair or change in use.

To find out which *objectives* are linked to a particular Division B requirement, refer to the Attribution Table in Supplementary Standard SA-1. Only the *objectives* beside the referenced Division B provision in the Attribution Tables need to be considered when analyzing a technical requirement.

3. Who or What is To Be Protected?

"OS Safety

An objective of this Code is to limit the probability that, as a result of the design or construction of a building, ***a person in or adjacent to the building*** *..."*

Objectives clearly specify who or what is to be protected by the provisions of the Code by specifying whether **persons** or **buildings** are to be protected. Examples of who or what is to be protected in the Building Code are:

- a person in the building
- a person adjacent to the building
- the public
- a person with a physical or sensory disability
- the building
- the building or part of it
- adjacent buildings
- a natural resource
- water resources
- the natural environment

Building contents (personal property) and animals are not included in the list of who or what is to be protected.

Objectives state whether persons, buildings, the environment or resources are to be protected.

4. From What Risks are the Who and the What to be Protected From?

"OS Safety
*An **objective** of this Code **is to limit the probability that**, as a result of the design or construction of a building, **a person** in or adjacent to the building **will be exposed to an unacceptable risk of injury** ..."*

Every top-level objective corresponds to a particular type of risk.

OS Safety	"... an unacceptable risk of **injury**"
OH Health	"... an unacceptable risk of **illness**"
OA Accessibility	"... a person with a physical or sensory disability will be unacceptably **impeded from accessing or using** ..."
OP Fire, Structural, Water and Sewage Protection of Buildings	"...the building or adjacent buildings ... an unacceptable risk of **damage** ... or **loss** "

From Div. A, Table 2.2.1.1., read the top-level *objective* for OR, Resource Conservation, OE, Environmental Integrity and OC Conservation of Buildings.

Top-level objectives deal with limiting the risks of:

OS Safety .... Injury
OH Health .... Illness
OA Accessibility .... Impeded Access or Use
OP Fire, Structural,
Water and Sewage
Protection of Buildings ......Damage or Loss of Use
OR Resource Conservation...Depletion or capacity
OE Environmental Integrity...Degradation
OC Conservation of Buildings...Unacceptable conservation

As previously mentioned, the Code is not intended to eliminate all risk. Even when all applicable Code provisions have been complied with, there is still a residual risk that something bad might happen. For example, a person may still trip and fall on stairs that are designed in accordance with Division B. However, this residual level of risk is the risk that society as a whole deems to be acceptable.

5. The Causes of Risks Addressed by the Code

The causes of the risks are defined in the second and third-level *objectives.*

For example, the Code deals with four aspects of Safety. The four second-level objectives for Safety are:

- OS1 Fire Safety
- OS2 Structural Safety
- OS3 Safety in Use
- OS4 Resistance to Unwanted Entry

Using OS1 Fire Safety as an example, the text of the second and third-level *objectives* is:

"OS1 Fire Safety

An objective of this Code is to limit the probability that, as a result of the design or construction of a building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury ***due to fire. The risks of injury due to fire addressed in this Code are those caused by—***

> ***OS1.1 – a fire or explosion***
>
> ***OS1.2 – fire or explosion impacting areas beyond its point of origin***
>
> ***OS1.3 – the collapse of physical elements due to a fire or explosion***
>
> ***OS1.4 – fire safety systems failing to function as expected***
>
> ***OS1.5 – persons being delayed in or impeded from moving to a safe place during a fire emergency***

Third–level objectives, e.g. OS1.1 to OS1.5, specify the causes of the risk. These causes are introduced by a phrase in the second-level objective, such as "*The risks of injury due to fire in this Code are those caused by—.*"

The third-level *objective* states an event leading to the risk, such as "*OS1.1 – a fire or explosion.*"

STOP

Objectives in the Electronic Version of the Code

Many Division B provisions are linked to more than one *objective.* Using the CD-ROM containing the electronic version of the Code, you are able to access all *objectives* and functional statements for each provision by clicking on links and opening different windows.

We have seen that *objectives* and functional statements are closely related. Related *objectives* and functional statements are grouped together on the CD-ROM.

Each *objective* and functional statement group is shown in a separate window. The window can be selected by clicking on the tab that is labeled with an *objective.*

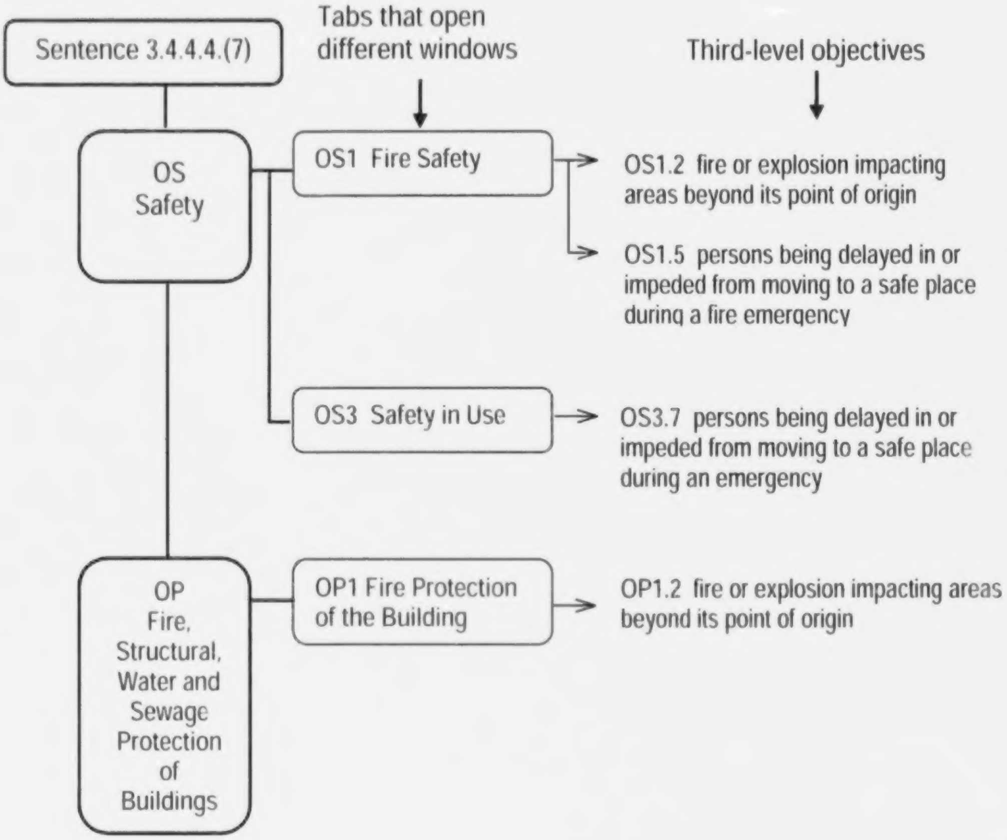
A provision might have several windows that group related objectives, functional statements. It is important to review the content of all windows.

STOP

Exercise 8-3 (Guided)

The purpose of this exercise is to observe how the CD-ROM containing the Code will show multiple *objectives* linked to one provision.
Div. B, Sentence 3.4.4.4.(7):
A service room shall not open directly into an exit.
From Attribution Table 3 in SA-1:
[F06-OS1.2] [F05, F06-OS1.5]
[F06-OP1.2]
[F43-OS3.7]

Here is a graphical representation of the *objectives* that are linked to Div. B, Sentence 3.4.4.4.(7):


Sentence 3.4.4.4.(7)
Tabs that open different windows
Third-level objectives
OS Safety
OS1 Fire Safety
OS1.2 fire or explosion impacting areas beyond its point of origin
OS1.5 persons being delayed in or impeded from moving to a safe place during a fire emergency
OS3 Safety in Use
OS3.7 persons being delayed in or impeded from moving to a safe place during an emergency
OP Fire, Structural, Water and Sewage Protection of Buildings
OP1 Fire Protection of the Building
OP1.2 fire or explosion impacting areas beyond its point of origin

Functional Statements

Functional statements were introduced in Module 3 and revisited in Module 7. The list of *functional statements* is located in Div. A, Part 3, Table 3.2.1.1.

Functional statements describe the conditions in the building that help to satisfy the *objectives*. *Functional statements* answer the question "What is the building (material, system or building design) supposed to accomplish?" A *functional statement* in Div. A, Part 1 Sentence 1.4.1.2.(1) means:

> *a function set out in Division A, Table 3.2.1.1. that a building or an element of a building is intended to perform.*

Functional statements are specific short statements. Like *objectives*, *functional statements* are qualitative, not quantitative, and cannot be used on their own to design a building.

Functional statements describe what must be accomplished for the objectives to be met.

Functional Statements – Div. A, Part 3, Table 3.2.1.1.

There are gaps in the alpha-numerical numbering system of Div. A, Table 3.2.1.1. This is to allow for the insertion of other *functional statements* in the future. Also, *functional statements* are organized into groups covering similar issues. For example, *functional statements* F20 to F23 deal with structural issues and F40 to F46 deal with health issues.

Wording and Format of Functional Statements

The wording of *functional statements* follows a standard format that makes a *functional statement* easy to identify. Every *functional statement* starts with a verb.

Terms such as "to eliminate," "to stop" or "to prohibit" **are never used** in *functional statements*. You will recall that if the Code wanted to eliminate all falls in stairs, it would have to prohibit the use of stairs in buildings.

The provisions of the Code are to minimize risk; consequently, the following terms are used in the wording of *functional statements*.

- *to minimize*
- *to limit*
- *to maintain*
- *to resist*
- *to facilitate*
- *to retard*

STOP

Exercise 8-4

Fill in the blanks below by finding the appropriate *functional statement* in Div. A, Part 3, Table 3.2.1.1., forming part of Sentence 3.2.1.1.(1).

The purpose of this exercise is to gain familiarity with *functional statements*.

1. F_____ To _______________ the _______________ of _______________ to _______________ as a result of tripping, slipping, falling, contact, drowning or collision.

2. F_____ To _______________ _______________ _______________ humidity.

3. F_____ To _______________ _______________, in a timely manner, of the need to take action in an emergency.

4 F_____ To _______________ _______________ or _______________ due to the effects of ____________.

Identifying the Objectives and Functional Statements for Division B Provisions

The Attribution Tables are in Supplementary Standard SA-1. For example, Table 3 is titled "*Objectives* and *Functional Statements* Attributed to the *Acceptable Solutions* in Part 3 of Division B". In the electronic version of the Code, the attributions can be accessed by clicking on the icon next to the provision.

Not all Division B provisions are linked to *objectives* and *functional statements*. Some Division B provisions are not technical requirements. Instead, they support the technical requirements by defining terms, providing clarification, directing Code users to another provision, or expanding or limiting the application of a technical requirement. Refer to Module 4 for examples of these types of provisions.

If it is necessary to consider one of these non-attributed provisions in the evaluation of an *alternative solution*, use the *objectives* and *functional statements* linked to the referenced provisions.

For example, Div. B, Sentence 9.12.2.2.(5) is an exception to the requirement regarding the minimum depth of foundations, which is described in Sentence 9.12.2.2.(1). Sentence 9.12.2.2.(5) is not linked to any *objectives* or *functional statements* since it is an exception to the general rule of Sentence 9.12.2.2.(1). If required, the *objectives* and *functional statements* from Sentence 9.12.2.2.(1) should be used for Sentence 9.12.2.2.(5) since that provision is linked with *objectives* and *functional statements*.

STOP

Exercise 8-5

Use the Attribution Tables to answer the questions below. The purpose of the exercise is to use the Attribution Tables to find linked pairs of *objectives* and *functional statements*.

1. What are the pairs of *functional statements* and *objectives* that are linked to Div. B, Sentence 9.8.4.1.(1)?

2a. What do you notice about the linked pairs of *functional statements* and *objectives* that are attributed to the provisions of Div. B, Subsections 9.8.2. to 9.8.6.?

2b. What conclusion can you draw from your observation?

3. Div. B, Sentence 9.20.6.1.(1) states the minimum thickness for exterior masonry walls. If an alternative solution involved this provision, would performance with respect to functional statement F03 and objective OS1.2 need to be evaluated?

4. Div. B, Sentence 3.4.3.1.(1) provides that for the purpose of determining the aggregate width of exits, the occupant load of every room or floor area shall be determined based on Subsection 3.1.17. In Attribution Table 3 of SA-1, Sentence 3.4.3.1.(1) is not directly linked to any *functional statements* and *objectives*. Where would you find the *functional statements* and *objectives* to be used with this provision?

B. Using Objectives and Functional Statements in the Evaluation of Alternative Solutions

As seen on Day 1, *objectives* and *functional statements* are ***not required*** when confirming compliance with the applicable *acceptable solutions* of Division B. However, it may be useful to read them to find out more about the reasons for a particular requirement.

Objectives and *functional statements* **are required** in the evaluation of *alternative solutions* as per Div. A, Clause 1.2.1.1.(1)(b):

> *Compliance with this Code can be achieved by using alternative solutions that will achieve the level of performance required by the applicable acceptable solutions (of Division B)* ***in respect of the objectives and functional statements attributed to the applicable acceptable solutions*** *in Supplementary Standard SA-1.*

Areas of Performance

You will recall from Module 5 that we condensed the phrase "*…in respect of the objectives and functional statements attributed to the applicable acceptable solutions in Supplementary Standard SA*-1" to "areas of performance".

In simple terms, the "*areas of performance*" tell you *which objectives and functional statements are attributed to the acceptable solution to evaluate* a proposed alternative solution.

An everyday example of buying a car was discussed. The "areas of performance" you might evaluate when purchasing a car would be decided by you, and might include purchase price, fuel economy, maintenance costs and load capacity.

When an *alternative solution* is proposed, ***the Attribution Tables in Supplementary Standard SA-1*** dictate what "areas of performance" must be evaluated. The "areas of performance" come from the *objectives* and *functional statements* that are linked to the applicable *acceptable solutions* of Division B.

The "area of performance" is defined by the linked functional statement-objective pairs. The pairs describe what needs to be accomplished (the function) and why (the objective).

Pairs of Objectives and Functional Statements

Objectives and *functional statements* are used together to determine the ***areas of performance*** that must be assessed when evaluating a proposed *alternative solution*.

Each *functional statement-objective* pair will answer the question **"What has to be accomplished and why?"** so it can be confirmed that the proposed *alternative solution* complies with the Code.

It is also necessary to answer **"How much has to be done?"** or **"How well does the alternative solution need to perform?"** The assessment of the level of performance of the applicable Division B provisions (Step 8b) will answer these questions. This will be examined in Module 11.

The order of the *objective* and *functional statement* pair is not important. It was decided to put the *functional statement* first for clarity and ease of use.

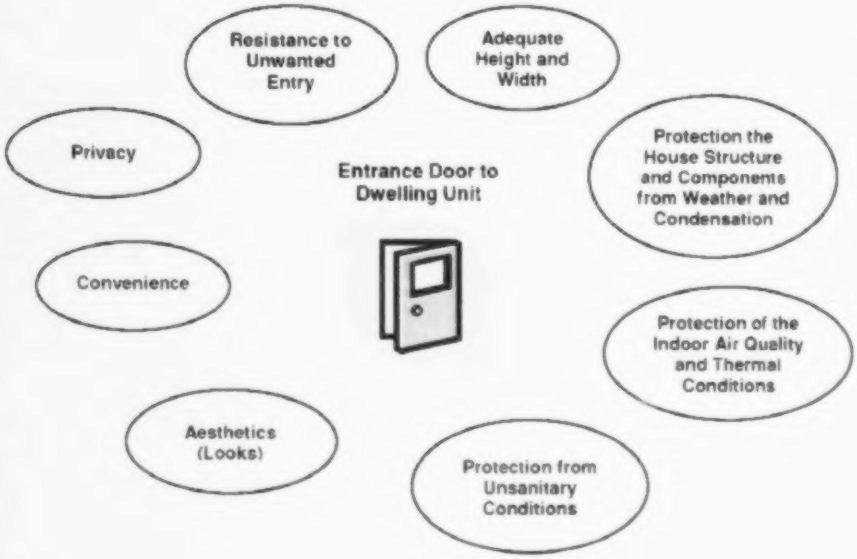
The *functional statements* and *objectives* are required to be in pairs to fully explain all of the reasons for a particular Division B building code provision.

STOP

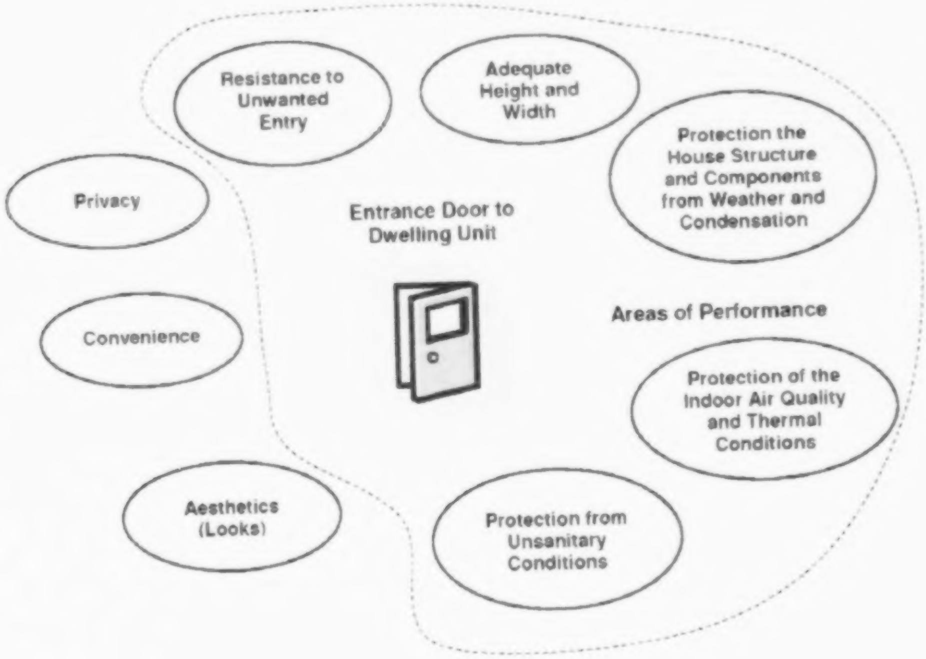
Example of "Areas of Performance"

Let's revisit the graphic we saw in Module 7 dealing with the entrance door to a dwelling unit.

The graphic below illustrates the functions that could be considered in the selection of an entrance door.


Resistance to Unwanted Entry
Adequate Height and Width
Privacy
Entrance Door to Dwelling Unit
Protection the House Structure and Components from Weather and Condensation
Convenience
Protection of the Indoor Air Quality and Thermal Conditions
Aesthetics (Looks)
Protection from Unsanitary Conditions

The Code requires that an entrance door perform only some of these functions. Similarly, any *alternative solution* would have to perform the same specified functions. Since there are no *functional statements* for privacy, convenience, and aesthetics, these features would not be considered in the evaluation of an *alternative solution*.


Resistance to Unwanted Entry
Adequate Height and Width
Protection the House Structure and Components from Weather and Condensation
Privacy
Entrance Door to Dwelling Unit
Areas of Performance
Convenience
Protection of the Indoor Air Quality and Thermal Conditions
Aesthetics (Looks)
Protection from Unsanitary Conditions

"Areas of Performance" for Alternative Solutions

A proposed *alternative solution* must demonstrate that it performs the functions required by the Code.

For example, Div. B, Sentence 9.6.3.1.(1) requires that doors within dwelling units to be of a minimum size. If a proposed door were not wide enough, it would not satisfy the requirement. It could be redesigned to comply or could be submitted for evaluation as an *alternative solution*. The "areas of performance" to be evaluated against the level of performance of the *acceptable solution* and that of the *alternative solution* are defined by the *functional statement-objective* pairs in the Attribution Table 9 of SA-1.

[F30-OS3.1]

[F10-OS3.7]

The *objectives* linked to the requirement are related to safety in use (OS3). In this *alternative solution*, the resistance to unwanted entry or protection of indoor air quality are not required to be evaluated since these *objectives* are not linked to Div. B, Sentence 9.6.3.1.(1).

The functions that Sentence 9.6.3.1.(1) requires an *alternative solution* to perform are:

F10 To facilitate the timely movement of persons to a safe place in an emergency.

F30 To minimize the risk of injury to persons as a result of tripping, slipping, falling, drowning or collision.

Sample *alternative solutions* for an entrance door to a dwelling unit are listed in the table that follows. The Division B provision, the *objectives* and *functional statements*, and the "areas of performance" are listed for each *alternative solution*.

Proposed Alternative Solution	Applicable Division B Provision	Objectives and Functional Statements	Areas of Performance To Be Evaluated
The entrance door is only 750 mm wide.	9.6.3.1.(1) and Table 9.6.3.1.	F30-OS3.1 F10-OS3.7 None for Table	Functions that need to be performed: F30 Minimize collision F10 Facilitate safe evacuation Why: OS3 Safety in use
A security camera is provided instead of a deadbolt lock and door viewer.	9.6.8.3.(1)	F34-OS4.1	Functions that need to be performed: F34 Resist unwanted entry F35 Facilitate identification of potential intruders Why: OS4 Resistance to unwanted entry
	9.6.8.8.(1)	F35-OS4.2	
A custom metal door does not include thermal breaks.	9.6.7.2.(1)	F63-OH1.1 F63-OH1.2 F63-OS2.3 F131-OR2	Functions that need to be performed: F63 Limit moisture condensation F131 Limit excessive energy consumption Why: OH1 Indoor conditions OS2 Structural safety OR2 Resource Conservation – Energy Conservation

Example of a Linked Pair of Objective and Functional Statement

Div. B, Clause 6.2.3.8.(7)(a) states:

> *Exhaust ducts connected to laundry drying equipment shall be independent of other exhaust ducts.*

The *functional statement* and *objective* attributed to this Div. B provision as found in Attribution Table 6 in Supplementary Standard SA-1 is:

[F81-OS1.1]

This means that Clause 6.2.3.8.(7)(a) is linked to one *functional statement*, F81, and one *objective*, OS1.1. This linked pair describes the "area of performance" that must be evaluated.

What has to be accomplished?

> **F81 To minimize the risk of malfunction, interference, damage**, tampering, lack of use or misuse.

Why?

> *An objective of this Code is to **limit the probability that**, as a result of the design or construction of a building, **a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to fire**. The risks of injury due to fire addressed in this Code are those **caused by**—*
>
> *OS1.1 **fire or explosion.***

This can be shortened and simplified to **"To minimize the risk of malfunction, interference or damage** so that **people are not injured due to fire."**

STOP

"Areas of Performance" Worksheet

You may wish to try to convert the words of the *functional statements* and the *objectives* into plain language. It is not necessary, but it may help in communicating with others.

In Module 7 we used a simple sentence to describe ***what*** is required and ***why***:

> "The alternative solution must <*functional statement*> for <*objective*> reasons."

Below is another approach that uses more information extracted from the text of the *objective*.

A worksheet is presented in this module to help you develop a working sentence in your own words to define the "areas of performance". A rewording of the *functional statement-objective* pair can be useful in answering the questions "what is this provision meant to achieve?" and "what does the *alternative solution* need to do and why?"

The *functional statements* and *objectives* are linked by the words "so that" to capture their relationship:

> The building is to <*insert functional statement*> **so that** a person/building is not (injured, made ill, damaged, etc.) due to <*insert third-level objective*>.

As shown previously, an example of a rephrased pair is: To minimize the risk of malfunction, interference or damage (F81) so that people are not injured due to fire (OS1.1).

Remember, in all cases, the text of Div. B of the Code is always the point of reference and expresses the official requirement(s).

The process for using the worksheet is as follows:

1. **Write the applicable Division B provision (acceptable solution) in Column 1.**

   Work on one Division B provision at a time; use more than one sheet if necessary.

2. **Write the references for the linked functional statement-objective pairs in Columns 2 and 3.**

   Refer to the Attribution Tables in Supplementary Standard SA-1. Write the alpha-numerical reference of each pair of *functional statements* and *objectives* shown.

3. **Rephrase the functional statement in Column 4.**

   Refer to the list of *functional statements* in Division A, Table 3.2.1.1. Try to use the same verb and capture the key point of the *functional statement*. If required, refer back to the Division B provision to narrow the scope of the *functional statement*.

4. **Rephrase the objective in Column 6.**

   Refer to the list of *objectives* in Division A, Table 2.2.1.1. Indicate whether people (who) or (what) building, natural resource, water resources, natural environment or conservation of building must be protected and paraphrase the key point of the *objective(s)* in plain language. This can be stated positively in terms of what action should be encouraged, or it can be stated negatively in terms of what harm is to be limited.

"AREAS OF PERFORMANCE" WORKSHEET

Applicable Provisions	FS	OBJ	Functional Statement		LINK	Objective	
			To <function>	What/from		People/ building (other, specify)	Not <harmed> due to OR can <action>
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
Column 1	2	3	4		5	6	

Exercise 8-6 (Guided)

The sample worksheet on the next page illustrates how to determine the "areas of performance" for a proposed *alternative solution* regarding a laundry exhaust duct.

1. The applicable *acceptable solution* (provision) is Div. B, Clause 6.2.3.8.(7)(a).

2. The linked *functional statement-objective* pair is written in Columns 2 and 3.

3. It is clear that some words in *functional statement* F81 do not apply in this case. For instance, tampering and lack of use or misuse are obviously not relevant to the requirement to provide an independent laundry exhaust duct.

   Only the portion "To minimize malfunction, interference or damage" is relevant since these three things may happen if the laundry exhaust duct is not independent of other exhaust ducts.

   If the context of the Division B Code provision is not immediately clear, it may be helpful to consult the intent and application statements on the CD-ROM. Where there is doubt about what words can be removed, the original *functional statement* should be checked during the evaluation process.

4. The *objective* addresses limit the probability of "harm to persons" rather than "damage to buildings." Plain language is used to capture the basic idea of the *objective*: "limit the probability of people being injured due to fire."

   This language is very imprecise compared to the specific wording of the *objective*: "limit the probability that a person in or adjacent to a building will be exposed to an unacceptable risk of injury due to fire." Keep in mind that the *objectives* are written with a view to risk *avoidance* (not risk elimination), which is expressed by the words "… to limit the probability that …"

Once the worksheet is completed, the "area of performance" can be summarized as: "To minimize the risk of malfunction, interference or damage so that people are not injured due to fire."

Applicable Provisions	**FS**	**OBJ**	**Functional Statement**		**LINK**	**Objective**	
			To <function>	**What/from**		**People/ building**	**Not <harmed> due to OR can <action>**
6.2.3.8.(7)	F81	OS1.1	To minimize the risk of malfunction, interference or damage		*so that*	people are not injured due to fire	
Column 1	**2**	**3**	**4**		**5**	**6**	

Exercise 8-7

Find the *objectives* and *functional statements* for Div. B, Sentence 4.1.5.13.(1) and determine the "areas of performance" using one of the blank worksheets from the workbook Appendix 3.

Exercise 8-8

Find the *objectives* and *functional statements* for Div. B, Sentence 3.8.1.5.(1) and determine the "areas of performance" using one of the blank worksheets from the workbook Appendix 3.

Exercise 8-9

Find the *objectives* and *functional statements* for Div. B, Sentence 9.31.4.1.(1) and determine the "areas of performance" using one of the blank worksheets from the workbook Appendix 3.

How Do Objectives Apply to Referenced Documents (Standards)?

The Code provision that references a document (standard) identified in Div. B, Table 1.3.1.2. will have one or more *objectives* linked to it. These same objectives apply to the referenced document (standard).

However, those *objectives* may only deal with some aspects of the referenced document (standard), not everything in the referenced document (standard). In fact, the *objectives* of the Code may reference only part of what is described in the referenced document (standard).

Div. A, Sentence 1.5.1.1.(1) states:

> *The provisions of a referenced document in Divisions A and B apply only to the extent that the provisions relate to,*
> *a) buildings, and*
> *b) the objectives and functional statements attributed to the applicable acceptable solutions in Division B where the documents are referenced.*

For example, Div. B, Sentence 9.27.12.1.(4) references the aluminum sheet cladding standard CAN/CGSB-93.1-M, "Sheet, Aluminum Alloy, Prefinished, Residential". This referenced document (standard) contains specifications for colour uniformity of aluminum cladding. However, Sentence 9.27.12.1.(4) is linked only to specific *objectives* of ***health*** , [OH1.1, OH1.2 and OH1.3] and ***safety*** [OS2.1, OS2.3, OS2.4 and OS2.5]. There is no *objective* relating to colour uniformity.

This means that the Code does not require compliance with the parts of the referenced document (standard) that deal with colour uniformity since this does not help satisfy one of the *objectives* linked to Div. B, Sentence 9.27.12.1.(4).

In day-to-day compliance verification, a person having jurisdiction would normally only need to confirm that the product or system complies with the applicable referenced document (standard).

However, when comparing an *alternative solution* to the applicable Code provisions (Div. B *acceptable solutions*), it may be necessary to determine which "areas of performance" in a particular referenced document (standard) are relevant.

Now that we have examined *objectives* and *functional statements*, and learned how to determine the "areas of performance", we will return to Step 6b of the process for the evaluation of *alternative solutions*.

STOP

6b
Confirm Applicable
Objectives &
Functional Statements

Step 6b – Confirm Applicable Objectives and Functional Statements

This step is the key link between the identification of applicable Division B provisions (*acceptable solutions*) in Step 4b, and the verification of the level of performance of Division B provisions (*acceptable solutions*) in Step 7b.

In Step 6b, the applicable *objectives*, *functional statements*, and "areas of performance" are confirmed. This is the foundation for confirming the level of performance of the applicable Division B provisions (*acceptable solutions*) and the basis for evaluating the level of performance of the proposed *alternative solution*.

It is the responsibility of the person having jurisdiction to *confirm* that the *objectives* and *functional statements* indicated by the applicant are correct and complete.

It is important at this step to ensure the applicant:

- has considered **all** applicable provisions of Division B, and
- has evaluated the proposed *alternative solution* according to the correct *functional statements*, *objectives* and "areas of performance" for the related Division B Code provisions.

Assessing which Division B provisions are applicable may require judgment and consultation with others. The scope of the evaluation may need to be expanded.

For example, Div. B, Sentence 3.3.1.9.(1) requires the minimum width of a public corridor to be 1 100 mm. If a designer proposes a narrower dimension for a public corridor, he or she may have to also evaluate other related requirements in Sections 3.3., "Safety Within Floor Areas" 3.4., "Exits" and 3.5., "Vertical Transportation".

It becomes more complicated when the applicant wants to propose an alternate component for a system or an entirely different system from the design options permitted in Division B, *acceptable solutions*. In this situation, you might first consider where the product will be used and what functions the system is intended to perform.

For example, a designer wishes to use a new non-conforming composite material for a roof assembly. Div. B, Subsection 9.26.2., *Roofing Materials*, permits several roofing material options: asphalt shingles, concrete roof tiles and bituminous materials used in built-up roofs, etc….

The designer's first question might be "What do I compare the alternative product to?"

The answer is that the person having jurisdiction would normally require a technical evaluation of a product by qualified professionals, a materials testing laboratory, or NRC's Canadian Construction Materials Centre (CCMC). In the evaluation, all the intended functions of the roofing system must be considered. The evaluation cannot look at one component in isolation.

The technical evaluation must provide acceptable proof that the *alternative solution* will perform as well as the *acceptable solutions* in Division B. Where there are several acceptable design options, the evaluation would likely compare the alternative product to the most similar design option. For example, a proposed alternative composite roof shingle would probably be compared to a type of shingle accepted by the Code, not to a built-up roof system.

The evaluation must consider where the product will be used, and what functions the entire system is intended to perform. (The intended level of performance is sometimes not clearly stated in the *functional statements* linked to the *acceptable solutions*.)

Sentence (1) in Div. A, Article 1.2.2.1., *Characteristics of Materials, Appliances, Systems and Equipment*, states:

> *All materials, appliances,* ***systems*** *and equipment installed to meet the requirements of this Code shall possess the necessary characteristics to perform their intended functions when installed in a building.*

Therefore, when evaluating an alternative component of a system or design, it may be necessary to consider applicable provisions at the Article, Subsection or Section level, or even in other Parts of the Code, that deal with the intended level of performance of the system or design.

The Person having jurisdiction ensures that the evaluation of the alternative solution considers all related Division B provisions and their objectives and functional statements.

Summary

The key points of this module are:

- The *objectives* of the Code are the overall **goals** that the Code's Division B provisions are intended to achieve.
- A second-level *objective* defines the **aspect** of Safety, Health, Accessibility, Fire, Structural, Water and Sewage Protection of Buildings, Resource Conservation, Environmental Integrity or Conservation of Buildings that is being addressed.
- A third-level *objective* describes the specific **cause** of the risk of injury, illness, impeded access or damage.
- Summary

  A top-level *objective* describes the goal of the Code.
  A second-level *objective* describes the aspect of the objective.
  A third-level *objective* describes the cause of the injury, illness, etc.
- *Objectives* include the wording "*to limit the probability that*" to describe the unacceptable risks addressed by the Code.
- *Objectives* state whether persons, the public, a natural resource, water resources, the natural environment or buildings are to be protected.
- Top-level *objectives* deal with limiting the risks of:

OS Safety	Injury
OH Health	Illness
OA Accessibility	Impeded Access or Use
OP Fire, Structural, Water and Sewage	

Protection of Buildings
Damage or Loss of Use
OR Resource Conservation
Depletion Exceeded
Capacity
OE Environmental Integrity
Degradation
OC Conservation of Buildings
Unacceptable
Conservation

- *Functional statements* describe what must be accomplished for the *objectives* to be met.
- In simple terms, the "*areas of performance*" tell you what to evaluate for a proposed *alternative solution.*
- The "area of performance" is defined by the linked *functional statement-objective* pair(s), which describe(s) what needs to be done (the function) and why (the *objective*).
- Step 6b – Confirm Applicable *Objectives* and *Functional Statements.*

Self-Assessment

As a result of this module, I am able to:

- ☐ Recognize the format and general content of an *objective.*
- ☐ Recognize the format and general content of a *functional statement.*
- ☐ Describe how linked pairs of *objectives* and *functional statements* are used to define "areas of performance".
- ☐ Identify the "areas of performance" for a particular Division B provision.
- ☐ Describe Step 6b in the evaluation process for *alternative solutions.*

Where Do We Go From Here?

At the end of Step 6b, the "areas of performance" are known. The next steps are to verify the level of performance of the Division B provisions (*acceptable solutions*) and of the proposed *alternative solution*. The next module deals with how to assess and compare level of performance in Steps 7b, 8b and 9b.

END OF MODULE 8

Module 9

Level of Performance

Introduction

Establishing the level of performance of a Division B provision (*acceptable solutions*) and the level of performance of a proposed *alternative solution* is central to the process of evaluating *alternative solutions*. After a review of the difference between prescriptive and performance provisions, you will learn what is meant by level of performance with regard to both performance and prescriptive provisions. Steps 7b, 8b and 9b of the evaluation process will be examined in this module.

Learning Outcomes

At the end of this module, you will be able to:

- Describe the differences between prescriptive and performance provisions of Division B.
- Describe the meaning of "level of performance".
- Describe how to determine the level of performance of prescriptive and performance provisions.
- Identify tools and methods that may help to establish the level of performance.
- Describe Steps 7b, 8b and 9b of the evaluation process for *alternative solutions*.

Module Outline

The following topics are addressed in this module:

A. Performance and Prescriptive Provisions of Division B

B. General Comments on Level of Performance

Step 7b – Confirm Level of Performance of Applicable Division B Provision(s)

Step 8b – Confirm Level of Performance of Proposed *Alternative Solution(s)*

Step 9b – Compare Levels of Performance

Guided examples of Steps 7b, 8b and 9b are included at the end of the module.

Note that all Code references in this module are from Division B unless otherwise stated.

A. Prescriptive and Performance Provisions

There are two types of provisions in Division B – prescriptive provisions and performance provisions. An understanding of the differences between prescriptive and performance provisions will help when determining the level of performance.

Prescriptive Provisions of Division B

Prescriptive provisions specify what is required or how to meet a requirement. An example of a prescriptive provision is that an exit stair riser must have a height between 125 and 200 mm to satisfy Div. B, Part 3, Sentence 3.4.6.7.(2) of the Code.

Compliance with a prescriptive provision can usually be confirmed by visual inspection or a simple measurement.

For example, confirming that the height of a riser is in compliance is straightforward since the riser can be measured.

Imagine that the construction of a bookshelf is covered by the Code. Prescriptive requirements would specify the type of material for the shelves (e.g. sawn lumber or particleboard), the size and maximum spacing of fasteners, the maximum dimensions of the shelves, required bracing, etc…. Compliance could be confirmed by visual inspection or by using a tape-measure.

Compliance with a prescriptive provision can usually be confirmed by visual inspection or a simple measurement.

Examples of prescriptive provisions in Division B are:

> Sentence 9.9.6.2.(2): *The clear opening height under door closers and other devices in doorways described in Sentence (1) shall be not* ***less than 1 980 mm****.*
>
> Clause 3.4.2.5.(1)(a): *Except as permitted by Sentences (2),*

3.2.8.4.(4) and 3.3.2.4.(13) to (16), if more than one exit is required from a floor area, the exits shall be located so that ***the travel distance to at least one exit shall be not more than 25 m*** *in a high hazard industrial occupancy, etc....*

Sentence 3.2.6.13.(1)(a): ***A voice communication system or systems conforming to Article 3.2.4.22. shall be provided in a building*** *if the floor of the top storey is more than 36 m above grade...*

Performance Provisions of Division B

Performance provisions specify the performance that is expected of a certain building feature or system. Compliance with a performance provision can usually be confirmed with calculations, analysis or tests.

An example of a performance provision is Div. B, Sentence 3.2.6.2.(2), which requires high buildings to be designed to limit contaminated air in all floor areas that are above the lowest exit storey, to 1% by volume for a period of 2 hours after the start of a fire. Compliance with this provision can be demonstrated through:

- engineering design calculations and analysis, or
- testing with equipment.

Performance provisions may incorporate one of the following:

- Resistance to a specified load
- Maximum deflection of a structural member
- Percent of contaminated air
- Fire-resistance rating
- Air and vapour barriers leakage rates
- Air change rates
- Thermal insulation R values

Continuing with the bookshelf analogy, performance provisions would specify the *performance* expected of the bookshelf instead of stating any restrictions on the components.

For example, a performance provision might state that the shelves must support a minimum load of 400 N applied vertically at the centre of each shelf, and that the assembly must be capable of resisting a lateral load of 300 N applied on the top shelf with a maximum deflection of 10 mm.

Structural analysis or tests using the specified loads would have to be carried out to prove the bookshelf achieves the required performance.

Performance provisions state the required performance of a building feature without describing how to achieve compliance. Compliance can usually be confirmed by tests with equipment, calculations or engineering analysis.

Examples of Division B performance provisions include the following:

> Sentence 9.25.4.2.(1): *Vapour barriers shall have a **permeance not greater than 60 ng/(Pa•s•m^2)** measured in accordance with ASTM E96, "Water Vapor Transmission of Materials," using the desiccant method (dry cup).*
>
> Clause 3.2.8.9.(4)(a): *...air handling equipment....that will extract air directly... at **a rate of at least 6 air changes per hour**.*
>
> Sentence 4.1.5.13.(1): *Bleacher seats shall be designed for a **uniformly distributed live load of 1.75 kN** (400 lb) for each linear metre or for a **concentrated load of 2.2 kN** (500 lb) distributed over a length of 750 mm (2 ft 6 in), whichever produces the most critical effect on the supporting members.*
>
> Sentence 9.10.9.11.(1): *Except as provided in Sentences (2)and (4), residential occupancies shall be separated from all other major occupancies by a **fire separation having a fire-resistance rating of not less than 1 h**.*

Performance Provisions of Division B that are Without Quantifiable Criteria

Some performance provisions do not quantify (i.e., give a numerical value for) the required performance as is the case with Div. B, Clause 3.2.6.4.(1)(c): … and m*easures are taken to limit movement of smoke from a fire in a floor area below the lowest exit storey into upper storeys …*

This is a performance provision since it states the required outcome (i.e. limit smoke movement) without specifying how to achieve that outcome. It also does not specify how much smoke is permitted in the upper storeys. Some ways to limit smoke movement are suggested in Appendix A, but the Appendices are not considered as a legal, enforceable part of the Code. A designer may submit a Code Analysis in support of a design that limits smoke movement. The designer and the person having jurisdiction must then agree to what "limited smoke movement" means when confirming compliance with this provision.

STOP

Exercise 9-1 (Guided)

Review the Division B Code provisions below and indicate if they are performance or prescriptive provisions and justify your answer.

1. Sentence 9.27.10.5.(1): *Not less than 3 mm clearance shall be provided between hardboard siding and door or window frames.*

   Type of provision and why:

   ➢ Prescriptive because compliance can be confirmed by visual inspection or a simple measurement.

2. Sentence 9.15.2.2.(1): *Concrete block shall conform to CSA- A165.1, "Concrete Block Masonry Units," and shall have a compressive strength over the average net cross-sectional area of the block of not less than 15 MPa* (2,200 psi).

   Type of provision and why:

- Performance because compliance with the standard and strength requirement can only be confirmed through test results.

Exercise 9-2

Review the following Division B Code provisions and indicate if they are performance or prescriptive provisions and justify your answer.

1. Sentence 3.1.10.2.(3): *Except as permitted by Sentence (4), the required fire-resistance rating of a firewall, except for closures, shall be provided by masonry or concrete.*

   Type of provision and why:

   ____

2. Sentence 9.26.1.1.(1): *Roofs shall be protected with roofing, including flashing, installed to shed rain effectively and prevent water due to ice damming from entering the roof.*

   Type of provision and why:

   ____

3. Sentence 9.27.2.4.(1): *A clearance of not less than 200 mm shall be provided between finished ground and cladding that is adversely affected by moisture, such as untreated wood, plywood, OSB, waferboard and hardboard.*

   Type of provision and why:

   ____

4. Clause 6.2.2.3.(1)(a): *...an enclosed storage garage... shall have a mechanical ventilation system designed to limit the concentration of carbon monoxide to not more than 100 parts per million parts of air...*

   Type of provision and why:

   ____

5. Sentence 9.9.11.3.(4): *Illumination from lighting required in Sentence (1) shall be provided to average levels of not less than 10 lx at floor or tread level.*

   Type of provision and why:

   ____

6. Sentence 4.1.5.15.(2): *Individual elements within the guard, including solid panels and pickets, shall be designed for a load of 0.5 kN (113 lb) applied over an area of 100 mm by 100 mm (4 in x 4 in) located at any point in the element or elements so as to produce the most critical effect.*

   Type of provision and why:

   ____

7. Sentence 3.1.7.5.(3): *If an assembly is required to be of noncombustible construction and have a fire-resistance rating, it shall be supported by noncombustible construction.*

   Type of provision and why:

   ____

Division B of the 2006 Code contains both prescriptive and performance requirements. A performance code would contain only performance provisions.

Understanding the differences between performance and prescriptive provisions is a good foundation for understanding how to determine and confirm the level of performance of Division B provisions (*acceptable solutions*) and the level of performance of proposed *alternative solutions*.

B. General Comments on Level of Performance

As we saw in Module 9, Division C states that the applicant for a proposed *alternative solution* is responsible for submitting a Code Analysis (documentation) that includes:

- the applicable ***Division B provisions*** (*acceptable solutions*),
- the applicable (linked) *objectives*, and
- the applicable (linked) *functional statements*.

The applicant is also required to establish:

- the *level of performance* required by Division B provisions (*acceptable solutions*), and
- the *level of performance* provided by the proposed *alternative solution*.

In Module 7, we looked at how to determine the applicable Division B provisions (*acceptable solutions*).

In Module 8, we looked at how to use the applicable (linked pairs of) *objectives* and *functional statements* to determine the "areas of performance" that apply to the Division B provision (*acceptable solution*). In this module we will look at how to determine the level of performance of Division B provisions (*acceptable solutions*) and that of an *alternative solution*.

The role of the person having jurisdiction is to review a submitted Code Analysis, rather than to undertake the analysis. However, in order to evaluate a submission, it is important to ***understand how to establish the level of performance***. This process is explained in detail next.

The Meaning of Level of Performance

What does "level of performance" mean? In simple terms, level of performance is answered by the question:

> "***How well*** does a Division B provision (*acceptable solution*) or *alternative solution* do what it is supposed to do?"

In other words,

> "***How well*** does the *acceptable solution* or *alternative solution* perform its intended functions?"

The "intended functions" part of the question is defined by the pairs of *objectives* and *functional statements* linked to the applicable Division B *acceptable solution(s)* . This is called the "areas of performance"

It is often more difficult to answer the "how well" part of the question, since this is not defined in prescriptive provisions.

"How well" a provision or design accomplishes the *objectives* and *functional statements* may be qualitative (a description) or quantitative (measurable).

Level of Performance is *how well* a Division B provision (acceptable solution) or a proposed alternative solution performs in the areas described by the linked pairs of objectives and functional statements.

The idea of level of performance is not new: it was required to be assessed in the 1997 Code for proposed equivalents. However, little guidance or assessment tools were provided in the 1997 Code.

The term "level of performance" is similar to, yet different from the term "performance level" defined to mean the level of performance under which all or part of an existing building functions with respect to its building systems. In the case of a Part 10 Change of Use, Div. B, Sentence 10.3.2.1.(2) informs us that the performance level is determined in accordance with Article 10.3.2.2. and in the case of a Part 11 Renovation, Div. A, Sentence 11.4.1.1.(2) informs us that the performance level is determined from Subsection 11.4.2.

STOP

Everyday Examples of Level of Performance

Before we study the level of performance of Division B Code provisions, *acceptable solutions*, let's look at some examples of level of performance in our everyday lives.

Secured Gate: Imagine that you have been asked to secure a gate to prevent the entry of intruders. You could choose to secure the gate with plastic ties, with nylon rope, with a small chain and combination lock, or with a heavy chain and industrial-type padlock.

The goal is to prevent intruders. "How well does nylon rope prevent intruders?" "How well does a heavy chain and industrial type padlock prevent intruders?" Each option has a different level of performance.

New Car: Imagine that you are looking for a new car. You are comparing two cars:

Car A: $15,000 - average fuel economy
Car B: $20,000 - excellent fuel economy

If the purchase price is your only "area of performance" to evaluate, then Car A has a better level of performance since it costs less.

However, if you decide that both purchase price AND fuel economy are important, then you have two "areas of performance" to evaluate together for each car.

Assuming a certain gas price and that you will drive 30,000 kilometres a year, you determine that over 4 years you will "save" $5,000 driving Car B instead of Car A. Since you are planning on keeping the car for at least 7 years, you conclude that Car B has a better level of performance since the total of the purchase price plus fuel costs will be less over the period of your ownership.

Examples of level of Performance of Division B Provisions (acceptable solutions)

Here are two examples to help illustrate the concept of level of performance.

The Level of Performance of Stairs

Stairs in a public building are required to have a maximum rise of 200 mm and a minimum run of 230 mm, for a Div. B, Part 9 building or a minimum run of 255 mm, for a Div. B, Part 3 building. See Div. B, Article 3.4.6.7. and Table 9.8.4.2.

- **"Areas of Performance":** The linked pairs of *objectives* and *functional statements* state that this requirement serves to minimize the probability that persons will trip and fall so that people can evacuate safely and quickly.
- The **level of performance** of the stairs describes **"how well"** stairs with a 200 mm maximum rise and 230/255 mm minimum run reduce trips and falls and "**how well**" the stairs help people evacuate.
- **Level of Performance** can be described in words: the level of performance of stairs with a 200 mm maximum rise and a 230/255 mm minimum run is defined as steps that are deep enough for the length of a person's shoe and for a natural stride up and down the stairs. Studies of the movement of people on stairs may also show that people trip more often on stairs that are steeper than a 200 mm maximum rise and a 230/255 mm minimum run.
- **Level of Performance** can sometimes be described with numbers or measurements: the level of performance of stairs with a 200 mm maximum rise and a 230/255 mm minimum run is that the stairs can handle an average flow rate of 12 persons per minute per one-foot width of stair with a moderate density (SFPE handbook).

The Level of Performance of Wood Studs

In Part 9, Div. B, Table 9.23.10.1., 38 mm x 89 mm wood studs spaced at 600 mm o.c. are permitted in exterior walls of one-storey buildings, with a maximum unsupported height of 3 metres.

- **"Areas of Performance":** The linked pairs of *objectives* and *functional statements* state that wood studs are supposed to support and withstand loads and limit movement under expected loads and forces. This is to limit the probability that people will be injured or the building will be damaged due to structural or building envelope failure.
- The **level of performance** describes **"how well"** 38 mm x 89 mm wood studs, with an unsupported height of 3 metres, carry and withstand loads and limit movement under expected loads and forces.
- The **level of performance** can be described in words**:** the level of performance of the wood studs is that each 38 mm x 89 mm vertical stud with an unsupported height of 3 metres and spaced at 600 mm o.c. in an exterior wall has the compressive strength necessary to withstand expected vertical loads without failing. As well, each exterior wood stud does not deflect excessively under expected wind loads. This level of performance means that the risk of structural failure or building envelope failure is minimized.
- **Level of Performance** can sometimes be described with numbers from calculations or testing**:** the performance level of such wood studs is defined by the vertical load-carrying capacity, the maximum horizontal deflection, and the resistance to buckling of the framing. The level of performance of the wood studs in these "areas of performance" can be calculated or measured through testing. For example, tests may determine that the maximum vertical load-carrying capacity may be approximately 8 kN per stud and the corresponding maximum deflection may be about 8 mm depending on the cladding material (the measurements of 8 kN and 8 mm are fictitious and are only provided for the purpose of illustrating this example).

STOP

Steps 7b, 8b and 9b

Step 7b – Confirm Level of Performance of Applicable Division B Provision(s) (*acceptable solutions*), is intended to answer the question: "What is ***the Code's*** benchmark level of performance?"

Step 8b – Confirm Level of Performance of Proposed *Alternative Solution(s)*, should answer the question: "What is the level of performance of the ***proposed alternative solution***?"

Step 9b – Compare Levels of Performance, should answer the question: "Is the level of performance of the *alternative solution* (Step 8b) equal to or greater than the level of performance of the Code (Step 7b)?"

Common Sense Approach

At all stages of the evaluation process, you can ask yourself, "Does this proposal make sense?" and "Does this level of performance make sense?"

This is a similar process to what you might do in a checkout line at a grocery store. You might calculate in your head what the approximate cost of your cart of groceries will be and determine that it will be around $100. If the cashier says the total is $200, you will ask to review the details.

In the same way, look at a proposed *alternative solution* to determine if it makes sense, if the stated level of performance makes sense, and if the supporting documentation is reasonable. Ask the following questions:

- Are the assumptions made in the applicant's analysis appropriate in the current situation?
- Is the model or calculation method valid for this situation?
- Is the input information for the model or calculations correct?
- Are there any inconsistencies or contradictions in the submitted evaluation?
- Does the proposed *alternative solution* make sense?
- Is it going to perform the way it needs to perform?

STOP

7b
Confirm Level of Performance of Applicable Division B Provision(s)

Step 7b – Confirm the Level of Performance of the Applicable Division B Provisions (acceptable solutions)

Div. A, Clause 1.2.1.1.(1)(b) means that the level of performance of the applicable Division B provision (*acceptable solution*) is the ***benchmark*** that an *alternative solution* must at least meet. The benchmark is determined in Step 7b.

Step 7b involves determining the level of performance of Division B provisions (acceptable solutions).

Both performance provisions and prescriptive provisions of Division B have a level of performance.

Determining the level of performance of a performance provision is easier than that of a prescriptive provision and we will examine this first.

Level of Performance of Performance Provisions

Performance provisions were explained at the beginning of this module. Determining the level of performance of a performance provision is usually straightforward since the level of performance is typically stated ***in*** the Code's Division B provision.

For example, the level of performance of Sentence 3.2.6.2.(2) is stated in the text:

> *...a high building shall be designed so that contaminated air in all floor areas above the lowest exit storey will not contain more than 1% by volume of contaminated air for a period of 2 hours after the start of a fire...*

The level of performance is that **contaminated air is limited to 1% by volume for a period of 2 hours after the start of a fire.** This can be verified by design calculations or a test.

Some performance provisions do not numerically quantify the level of performance. For example, Div. B, Sentence 3.2.5.7.(1) states that "*An adequate water supply for firefighting shall be provided for every building.*"

When a Division B provision does not establish a level of performance, adequate performance must be established and proven by the designer. In the case of Sentence 3.2.5.7.(1) consult Appendix A and with Officials from the Fire Department.

For example, the designer may reference good practice guidelines to establish a level of performance. Under Ontario's 2006 Objective-Based Building Code, the proposed level of performance must be assessed and confirmed or rejected by the person having jurisdiction. Under Section 2.7. of the 1997 Code and former Section 9 of the *Building Code Act*, only the CBO or the RCA having jurisdiction could allow the use of equivalent materials, systems and building designs.

The level of performance of a performance provision is typically stated right in the Code's Division B provision.

Some performance provisions do not numerically quantify the level of performance so it must be established by the designer and agreed to by the person having jurisdiction.

STOP

Exercise 9-3

Write the level of performance of the following Division B performance provisions.

1. Div. B, Sentence 9.9.11.3.(4): *Illumination from lighting required in Sentence (1) shall be provided to average levels of not less than 10 lx (0.9 ft-candles) at floor or tread level.*

   ____

   ____

2. Div. B, Sentence 4.1.5.15.(2): *Individual elements within the guard, including solid panels and pickets, shall be designed for a load of 0.5 kN (113 lb) applied over an area of 100 mm by 100 mm (4 in by 4 in) located at any point in the element or elements so as to produce the most critical effect.*

   ____

   ____

3. Div. B, Sentence 9.26.1.1.(1): *Roofs shall be protected with roofing, including flashing, installed to shed rain effectively and prevent water due to ice damming from entering the roof.*

   ____

   ____

4. Div. B, Sentence 9.25.4.2.(1): *Vapour barriers shall have a permeance not greater than 60 ng/(Pa•s•m^2) measured in accordance with ASTM E96, "Water Vapor Transmission of Materials," using the desiccant method (dry cup).*

   ____

   ____

Level of Performance of Prescriptive Provisions

The Challenge

Division B provisions do not always establish a level of performance. This is most often true for prescriptive provisions since they often give the technical requirement without explaining the intended level of performance.

For example, Clause 3.4.2.5.(1)(a) requires a maximum travel distance of 25 m to the nearest exit in a high hazard industrial occupancy. The intended level of performance of this requirement is not given. The level of performance is not 25 m since this is just a measurement of length.

We know that this requirement relates to the ability to evacuate safely. But "how well" the 25 m travel distance facilitates safe evacuation is not stated.

Level of Performance in Words and Numbers

The level of performance of prescriptive provisions is likely to be described with words most of the time. This is called a *qualitative* value.

It is sometimes possible to describe the level of performance using numbers. This is called a *quantitative* value, and is only possible if a way to measure or model the level of performance is available.

Various tools and methods used to establish qualitative and quantitative levels of performance are discussed later in this module.

The Starting Point

There are a few important things to remember when determining the level of performance of prescriptive provisions:

- Realize that the process is not "cut and dry" or "black and white". There may not be a clear definition of level of performance for a particular issue.
- The process requires thinking "outside the box".

- Your experience and knowledge will be helpful in assessing level of performance values; and, you may also need to consult with others.

- Carefully consider *objectives*, *functional statements* and intent and application statements because these are your guides.

The Code does not contain a set procedure for establishing the level of performance since the procedure will vary for different Code provisions.

A suggested procedure is outlined in Exercise 9-4 that may help you to determine the level of performance. You may add more techniques from your past experience, and a principal authority may develop additional tools.

In Exercise 9-4 we look at a fictional proposed *alternative solution*. The example has been kept artificially simple to illustrate the process. Do not get caught up with the technical details of the *alternative solution*.

Exercise 9-4 (Guided)

Suggested Method to Determine the Level of Performance of a Prescriptive Provision

Let's continue with the laundry exhaust duct example used in Module 8.

Clause 6.2.3.8.(7)(a) states:

> *Exhaust ducts connected to laundry drying equipment shall be independent of other exhaust ducts.*

Step 6b – Confirm Applicable Objectives and Functional Statements

Confirm the linked pairs of *objectives* and *functional statements* attributed to the provision and use them to determine the "areas of performance". This is a crucial step since the "areas of performance" define the level of performance you need to analyze.

- **Clause 6.2.3.8.(7)(a) example:** In Step 6b, we summarized the "areas of performance" as: "To minimize malfunction, interference or damage so that people are not injured due to fire".

Step 7b – 1. Ask questions

Now that the specific "areas of performance" to be evaluated are established, think about the performance of the provision. The following questions may guide your thinking:

- How does the provision reduce the risk of undesirable consequences?
- Is there any other provision in the Code that allows an exception to this particular situation?
- Are there any factors that would affect the level of performance but that are not regulated by the provision or the Code?
- If any number (e.g. measurement, quantity) in the provision were increased or decreased, what impact would that have and in what way? (For example, if the lint were to build up to a certain thickness, how would it affect the risk of fire occurring?)
- What is the level of performance of a material, design or system that complies with this provision? In other words, "how well" does the *alternative solution* perform against the *acceptable solution* of Division B?

This is not an exhaustive list of questions and not all questions will be applicable to every provision. You are encouraged to think of your own questions to help you analyze the level of performance of Division B provisions.

- **Clause 6.2.3.8.(7)(a) example:** Many of these questions do not apply to the laundry exhaust duct example. However, we can conclude from the provision and the intent statement that the Code reduces the risk of a fire starting due to build-up of lint in building exhaust ducts by requiring laundry ducts to be independent of other exhaust ducts.

Step 7b – 2. Describe the level of performance using answers to questions.

A quantitative (numerical) statement of level of performance may not be possible for prescriptive provisions in Division B. However, with the *objectives*, *functional statements*, and intent and application statements, as well as some thinking about the Code provision, you can often describe the required level of performance.

- **Clause 6.2.3.8.(7)(a) example:** How much lint would build up if Clause 6.2.3.8.(7)(a) were complied with?
- An independent exhaust duct would lead to no build-up of lint in other exhaust ducts. Therefore, the level of performance of Clause 6.2.3.8.(7)(a) might be described as **no buildup of lint in other exhaust ducts**.

An applicant may submit documentation such as the following to support a ***qualitative*** assessment (value) of the level of performance of a Division B Code provision (*acceptable solution*). These tools will be discussed later in the module.

- fire hazard analysis
- evaluation of fire scenarios
- engineering analysis
- standards from other jurisdictions
- performance in practice/installation
- good engineering practice
- statistics
- past performance
- documents used to support requests for Code changes
- other

Step 7b – 3. If possible, make a quantitative (numerical) assessment (value) of the level of performance.

In some cases, it may be possible to describe the level of performance with numbers or measurements. It is the responsibility of the applicant to make a quantitative assessment (value) of the level of performance of both the applicable Division B provision (*acceptable solution*) and the proposed *alternative solution*.

Over time, the level of performance of various Code provisions may be established by your principal authority, another principal authority, a province or territory or at the national level.

- **Clause 6.2.3.8.(7)(a) example:** In this case, the quantitative level of performance for an independent laundry exhaust duct is **zero buildup of lint in other exhaust ducts**.

An applicant may submit the following documentation to support a ***quantitative*** assessment (value) of the level of performance. These tools will be discussed later in this module.

- product or material test results
- engineering analysis and mathematical modeling
- computer modeling
- documents used to support requests for Code changes
- risk analysis

Suggested Method to Determine
Level of Performance of Prescriptive Provision

Step 6b – Confirm Applicable Linked Pairs of Objectives and Functional Statements

- Determine "areas of performance"

Step 7b – Confirm Level of Performance of Applicable Division B Provision(s)

1. Ask questions
2. Describe level of performance
3. If possible, make a quantitative (numerical value) assessment of the level of performance

Level of Performance for Prescriptive and Performance Requirements

Type of Level of Performance	Type of Provision	
	Prescriptive	Performance
Quantitative Level of Performance (number that can be confirmed by calculations or testing)	X Level of Performance **not** in Code requirement. Applicant may provide analysis.	√ Level of Performance **often** in Code requirement. If not, applicant may provide analysis.
Qualitative Level of Performance (description in words on "how well" the provision performs the function)	√ Applicant describes Level of Performance.	√ Applicant describes Level of Performance.

When There Is More Than One Applicable Division B Provision

In Step 3, you may identify many applicable Division B provisions (*acceptable solutions*) that must be evaluated together. In such cases, the level of performance of ***all*** the applicable provisions should be considered as a whole rather than individually.

For example, a proposed *alternative solution* involving exterior sheathing for houses might also be required to contribute to bracing of the wall. In this case, the applicable Division B provisions for exterior sheathing and bracing should be considered together to establish the overall level of performance.

An extreme example is a proposal to construct an entire house out of a recycled material that is not recognized by the Code. In this case there will be many provisions related to safety, health, and the fire and structural protection of the building. This kind of proposal will require in-depth analysis and verification that all applicable Division B provisions have been considered. Each provision should not be considered individually, but rather the *overall level of performance* in each area of safety (OS), health (OH) and fire, structural, water and sewage protection of buildings (OP) etc…should be established in the evaluation process.

When Division B Contains Several Possible Design Options

There may be more than one design option in Division B for a building component that is addressed by a proposed *alternative solution*.

Continuing with the example of a proposed alternative roofing material introduced in Module 8, imagine a plastic roof tile is proposed as an alternative roofing product for a house. Subsection 9.26.2. lists a number of design options as *acceptable solutions*. However, each roofing material may have a different level of performance in terms of "how well" it resists the ingress of precipitation, water or moisture [F61].

The question is then "Which level of performance would you compare the alternative product's level of performance to?"

or, "Which option listed in Div. B, Subsection 9.26.2. has the (minimum) level of performance, for comparison purposes?"

The technical evaluation would likely compare the alternative product to the most similar design option that is accepted in Division B of the Code. At the same time, the evaluation must

- consider the roof as a system and identify the level of performance expressed in general provisions for roofing systems, and
- ensure that the alternative approach performs to the level expected of a roofing system. Sometimes the obvious expectations are not stated in the linked *objectives* and *functional statements*. For example, it is commonly understood that asphalt shingles are expected not to ignite or melt in hot sun and concrete roof tiles are expected not to crack due to freeze-thaw cycles.

Where there are different design options in the Code, careful analysis of functions is required to determine the minimum level of performance amongst the options.

An alternative solution has to perform at least as well as the acceptable solution with the lowest level of performance. It does not have to perform as well as the best option in Division B.

Where To Go From Step 7b?

- If the level of performance of the applicable Division B provision(s) (*acceptable solutions*) has been established, proceed to Step 8b.
- If the applicant has not established the level of performance of the applicable Division B provision(s) (*acceptable solutions*), or if there are questions about the conclusions, the applicant must repeat Step 7b or return to Step 1.

STOP

8b
Confirm Level of
Performance of
Proposed Alternative
Solution(s)

Step 8b – Confirm Level of Performance of the Proposed Alternative Solution

The level of performance of a proposed *alternative solution* is required to be analyzed and documented by the applicant. The technical evaluation of the performance of the *alternative solution* is the responsibility of the proponent, however the assessment of the Code Analysis (documentation) may require some level of technical evaluation to be undertaken by the person having jurisdiction.

It is the responsibility of the person having jurisdiction to evaluate the submitted information and to decide if the Code Analysis and submitted documentation adequately demonstrate compliance with Div. A, Clause 1.2.1.1.(1)(b), *alternative solutions*.

The process is similar to the responsibility to confirm compliance with Part 4 structural design, climatic data, referenced documents (standards) and design assumptions. The person having jurisdiction is generally not required to undertake the structural design or to check detailed calculations.

Step 8b –Evaluate the submission to determine if there is sufficient evidence to support the level of performance of the proposed alternative solution.

Resources to Assist in the Technical Evaluation

The evaluation of the proposed *alternative solution* may be technically complex. To assess the submitted evaluation, the person having jurisdiction may need the support of other parties such as:

- a third-party consultant (Fire Protection, Structural, Health and Safety, Testing Facility etc…)
- peer review (a review by another person who is qualified to give an opinion)
- a panel of experts or the Delphi Method (a review of a complex issue by a number of experts)
- appeals to the Building Code Commission or the Ontario Superior Court of Justice

Information That May Be Submitted to Establish the Level of Performance

The type of information submitted in support of an *alternative solution* may be different for each proposed *alternative solution*.

A Code Analysis (documentation) is required to form part of the submission to reflect the requirements of Division C, Subsection 2.1.1. The Code Analysis must include the information that will support the evaluation of the *alternative solution*, as discussed in Step 2.

Table 11-1 of this manual lists tools and methods for the assessment of the level of performance and highlights elements to check for each method, as well as the advantages and disadvantages of each method. In the analysis of an *alternative solution*, more than one tool or method may be needed.

Many of the assessment tools and methods to determine the level of performance are based on scientific or engineering principles and will typically quantify the level of performance of a proposed *alternative solution*.

However, other performance assessment methods are based on the opinion of professionals and result in a qualitative conclusion. These methods are frequently used where technical information is not available or where the issues are complex.

It is necessary to analyze the following for all performance assessment methods:

- the assumptions and limitations of the analysis,
- the qualifications of the person(s) doing the analysis, and
- the validity of the use of that type of analysis.

STOP

Table 11-1: Tools for the Assessment of Level of Performance

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Table 11-1: Tools for the Assessment of Level of Performance

Tool	Elements to Check	Advantages	Disadvantages
Product or Material Test Results	• Test is done by an accredited agency • Test is specific to proposed product/material • Variations between the test and intended application • Assumptions	• Pass or fail is easy to distinguish	• May be difficult to confirm that test is equivalent to a test recognized in the Code • Careful assessment is required to determine if conditions associated with the test are applicable to the proposed use of the product/material • Can be expensive depending on type of test
Evaluation of Scenarios (Hazard Analysis)	• Scenarios are realistic • All suitable scenarios are considered • Credible worst case scenario is considered • (Fire) Assumptions related to Fire Department response time, occupant characteristics, fuel load, building characteristics are valid • (Envelope) Assumptions related to temperature, humidity and exposure are valid • All variables are considered	• Provides the basis for a thorough, logical assessment of the possible fire scenarios and can help focus the analysis • Can give a reasonable prediction of performance where actual tests are not possible • Usually cost effective	• Scenario analysis is qualitative and is dependent on the base assumptions • Risk that a possible scenario will be overlooked • Third-party or peer review may be necessary

Tool	Elements to Check	Advantages	Disadvantages
Engineering Analysis and Mathematical Modeling • Structural calculations • Egress analysis • Environmental analysis for building envelope • Radiation exposure calculations for limiting distance • Design fire analysis	• Input data ○ Loads for structural assessment ○ Building characteristics ○ Occupant characteristics ○ Design fire data • Design Methodology • Factors of Safety • Qualifications of proponent	• Can give a realistic prediction of performance where actual tests are not possible • Sensitivity analysis can help confirm conclusions • Industry validated methods available • May be less costly than computer modeling or full-scale tests	• Requires knowledgeable person to assess suitability, input data and analyze results • May be costly • May require analysis by a third-party or peer review
Computer Modeling	• Theoretical basis for model • Applicability to the proposal • Input data • Output data • Qualifications of proponent	• Can give a realistic prediction of performance where actual tests are not possible • Industry validated models are available	• Requires knowledgeable person to assess suitability, input data and analyze results • Programming methodology is inherent to program and not usually available for scrutiny • May be costly • May require analysis by a third-party or peer review

Tool	Elements to Check	Advantages	Disadvantages
Previous Approvals by Other Persons Having Jurisdiction	• Similarity of product/material/ design/system • Conditions and limitations • Codes and standards that form basis of approval (including foreign ones)	• Similar proposal has been previously analyzed • Usually inexpensive	• Similar proposal may have been evaluated to different criteria • Qualifications of original applicant and reviewer may not be readily available
Manufacturer's Information	• Publishing date • Jurisdictions for which the information was written • Date of tests (has product changed since then?)	• Information may be specific to the product	• Information may not relate to the areas of performance to be evaluated • Information may have a marketing focus • Information may not be technically accurate
Published Standards Not Referenced in the Code	• Application and scope of standard • Date of publication • Intent of standard • Applicability to proposed alternative solution	• Standard recognized in other jurisdictions	• May be based on different performance levels than Division B of 2005 Code • May be based on different areas of performance
Research Papers	• Assumptions and limitations of research • Qualifications of author(s)	• May be the only technical information available for innovative technologies	• Peer review of conclusions may be necessary

Tool	Elements to Check	Advantages	Disadvantages
Risk Analysis	• Assumptions and limitations of analysis • Basis for input data	• Can give a reasonable prediction of risk if accurate data is available	• Input data may be difficult to verify
Performance Assessment Methods • Peer review • Delphi Method* • Panel of experts	• Qualifications of persons involved • Methodology of assessment	• May be the only option available where technical information is not available or testing is not possible • May be most suitable for large, complex alternative solutions	• May be costly and may require extended time period for consensus to be reached

* The Delphi Method is a coordinated review of a complex issue by a number of experts in the field.

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What is Acceptable Proof?

The technical evaluation of a proposed *alternative solution* can range from the simple to the complex. Judgment will be required to determine if:

- you have received enough supporting documentation,
- the documentation demonstrates the level of performance of the *alternative solutions* is sufficient against that of the applicable "areas of performance" established by the linked pairs of *objectives* and *functional statements* attributed to the applicable Div. B provisions (*acceptable solutions*).

Ultimately, the decision on the acceptability of the proof will be the responsibility of the person having jurisdiction.

The person having jurisdiction (CBO/Inspector/RCA/ Authorized Person) is responsible for determining if the submitted documentation of level of performance is acceptable.

Where To Go From Step 8b?

- ➢ If the proof is acceptable, and the level of performance of the proposed *alternative solution* is determined to be satisfactory, proceed to Step 9b.
- ➢ If the proof is determined to be unacceptable, or if the proof is not sufficient to confirm matching levels of performance in the required "areas of performance", the applicant must redo Step 8b or return to Step 1.

STOP

Exercise 9-5 (Guided)

Step 8b – Laundry Exhaust Duct

The proposed *alternative solution* involves a laundry exhaust duct that is connected to a washroom exhaust duct before discharging to the outdoors.

The applicable Division B provision is Clause 6.2.3.8.(7)(a).

We previously established that the **Division B level of performance was zero entry of lint into other exhaust ducts**.

What is the level of performance of the proposed *alternative solution*?

- There is a possibility that lint from the laundry exhaust duct will enter into connected exhaust ducts.
- To deal with this possibility, the applicant has specified that the system will be designed so that the washroom exhaust fan will always be operating. The positive pressure in the washroom exhaust duct will prevent lint from entering into that duct.
- The applicant also proposes to install a back pressure device that will prevent washroom exhaust air from entering the laundry exhaust duct when such laundry exhaust duct is not in use.
- The applicant concludes that the **level of performance of the proposed alternative solution is zero entry of lint into other exhaust ducts.**

The person having jurisdiction would assess the level of performance of the proposed *alternative solution* and review the documentation submitted in support of the proposal and would either accept or refuse the proponent's analysis.

9b
Compare
Levels of
Performance

Step 9b – Compare Levels of Performance

The next step is to compare the level of performance of the Division B provision (*acceptable solution*) with that of the *alternative solution*.

If Steps 7b and 8b were comprehensively done, this Step should be straightforward.

- If the level of performance of the proposed *alternative solution* meets or exceeds the level of performance of the applicable Division B provision (*acceptable solution*), proceed to Step 10b.

If the level of performance of the proposed *alternative solution* is less than the level of performance of the applicable Division B provision (*acceptable solution*), the person having jurisdiction must inform the applicant. The applicant may have to return to Steps 7b, 8b, or to Step 1. Alternatively, the decision may be appealed to the Building Code Commission or the Ontario Superior Court of Justice under Sections 24 or 25 of the *Building Code Act* respsectively.

Exercise 9-6 (Guided)

Step 9b - Laundry Exhaust Duct

Compare the level of performance of Div. B, Clause 6.2.3.8.(7)(a) with that of the proposed *alternative solution* for the laundry exhaust duct.

- In Step 7b, the level of performance of Clause 6.2.3.8.(7)(a) was determined to be **zero entry of lint into other exhaust ducts.**
- In Step 8b, the level of performance of the proposed *alternative solution* was determined to be **zero entry of lint into other exhaust ducts.**

  It is up to the person having jurisdiction to determine if the level of performance of the Division B provision (*acceptable solution*) will be satisfied by that of the *alternative solution*.

If the person having jurisdiction decides that the proposed *alternative solution* complies with Div. A, Clause 1.2.1.1.(1)(b), you may proceed to Step 10b, which is discussed in Module 10, and consider establishing conditions of approval.

Summary

- Compliance with a prescriptive provision of Division B can usually be confirmed by visual inspection or simple measurement.
- Performance provisions of Division B usually state the required level of performance of a building feature without describing how to achieve compliance. Compliance can usually be confirmed by standard tests, calculations or engineering analysis.
- Division B of the 2006 Code contains both prescriptive and performance requirements. A performance code contains only performance provisions.
- The level of performance is "how well" a Division B provision or a proposed *alternative solution* meets the linked pairs of *objectives* and *functional statements* attributed to the provision in the Tables of Supplementary Standard SA-1.
- Step 7b involves determining the level of performance of the applicable Division B provisions (*acceptable solutions*). Both performance provisions and prescriptive provisions under Division B have a level of performance.
- The level of performance of a performance provision under Division B is typically stated right in the Code provision.
- Some performance provisions of Division B do not have a numerical value to quantify the level of performance so it must be established by the designer and agreed to by the person having jurisdiction.

- **Suggested Method to Determine Level of Performance of Prescriptive Provision**

  Step 6b – Confirm Linked Pairs of Applicable Objectives and Functional Statements

  - Determine "areas of performance"

  Step 7b – Confirm the Level of Performance

  1. Ask questions
  2. Describe the level of performance
  3. If possible, make a quantitative assessment of the level of performance

- Where there are different design options in Division B of the Code, careful analysis of functions is required to determine the minimum level of performance amongst the options. **The alternative solution has to perform at least as well as the acceptable solution with the lowest level of performance. It does not have to perform as well as the best option under Division B.**

- In Step 8b, the person having jurisdiction evaluates the documentation submitted by the applicant to determine if there is sufficient evidence to support the level of performance of the proposed *alternative solution*.

- In Step 9b, the person having jurisdiction compares the level of performance of the applicable Division B provision (*acceptable solution*) to the level of performance of the proposed *alternative solution*, and decides whether the proposed *alternative solution* complies with Div. A, Clause 1.2.1.1.(1)(b).

- The person having jurisdiction is responsible for determining if the submitted documentation on level of performance is acceptable.

The decision of the person having jurisdiction may be appealed to the Building Code Commission or the Ontario Superior Court of Justice.

Self-Assessment

As a result of this module, I am able to:

- ☐ Describe the differences between prescriptive and performance provisions under Division B.
- ☐ Describe the meaning of "level of performance" and "minimum level of performance" when the provisions of Division B offer multiple design options.
- ☐ Describe how to determine the level of performance of prescriptive and performance provisions under Division B and for *alternative solutions*.
- ☐ Identify tools and methods that may help to establish the level of performance.
- ☐ Describe Steps 7b, 8b and 9b in the evaluation process for alternative solutions.

Where Do We Go From Here?

After Step 9b is completed, you will know whether the *alternative solution* complies with Div. A, Clause 1.2.1.1.(1)(b) or if it does not provide an adequate level of performance.

When it complies, conditions of acceptance may be established. Whether accepted or refused, the process should be documented. Module 10 deals with Step 10b – Establish Conditions of Acceptance, if Any and the Final Step – Acceptance or Refusal and Document Retention.

END OF MODULE 9

Module 10

Conditions of Acceptance and Document Retention

Introduction

When the level of performance of a proposed *alternative solution* has been shown to meet or exceed the level of performance required by the applicable Division B provision (*acceptable solution*), the *alternative solution* is considered to comply with Div. A, Clause 1.2.1.1.(1)(b). However, the person having jurisdiction may consider imposing conditions of acceptance on the *alternative solution*. The person having jurisdiction should document the acceptance or refusal and specify the documents to be retained by the principal authority.

NOTA BENE:

While there is no legislative requirement under neither the *Building Code Act* nor the Building Code, to document decisions and retain records, from a risk management point of view it is highly advisable to do so.

Consult the records retention by-law of the principal authority for the retention period of records.

Learning Outcomes

At the end of this module, you will be able to:

- Describe Step 10b and the Final Step in the evaluation process.
- Describe why conditions may need to be established for the acceptance of an alternative solution.
- Describe the record of an accepted or refused *alternative solution*.

10b
Establish Conditions of Acceptance, if any

Step 10b – Establish Conditions of Acceptance, if any

Designs that comply with Division B provisions (acceptable solutions) will typically not have conditions imposed on their use. However, since *alternative solutions* may be based on characteristics related to the specific building or its use, occupancy, operations or maintenance, the acceptance of *alternative solutions* may depend on certain conditions.

Conditions of acceptance should deal with building and operational features necessary for the successful implementation of the accepted alternative solution.

Conditions of acceptance should address the ***integrity*** (effectiveness) of the *alternative solution* so that future modifications do not inadvertently compromise the *alternative solution*, in part or as a whole.

In other words, future changes to the building must take into account the specific circumstances (conditions) for which the *alternative solution* was accepted. Otherwise, the *alternative solution* may not perform as intended.

Conditions will often become apparent during the evaluation of a proposed *alternative solution*. Certain conditions may be established based on information provided by the applicant under Division C, Sentence 2.1.1.1.(2):

- ***Assumptions, limiting and restricting factors*** of the Code are required to be identified in the documentation (Code Analysis). Once the analysis is verified and accepted, these assumptions and limitations may be included with the conditions for the accepted *alternative solution*.
- The person proposing the *alternative solution* must identify any ***building performance parameters including any commissioning, operational and maintenance requirements***. Once verified, these conditions may become part of the accepted *alternative solution*.

Conditions that are identified in a previously accepted *alternative solution* or a database solution may also form the basis of conditions for the newly accepted *alternative solution*.

Examples of Conditions

Examples of conditions of acceptance could include, but are not limited to:

- limitation on occupant load,
- restriction on occupancy classification,
- maximum combustible content,
- maximum loads, dead, live, rain, snow, etc …
- restriction on hours of operation or supervision,
- specific operating conditions for building systems,
- environmental factors (indoor conditions),
- specific maintenance for certain building features,
- specific maintenance for equipment that is relied on for the *alternative solution*,
- reference to specific maintenance and testing requirements addressed by another Code (e.g. Fire Code),
- documentation or amendments to the Fire Safety Plan,
- minimum special training requirements for supervisory or maintenance staff,
- advisory notices to tenants and occupants, and
- special signs

Before a building system is put into regular use, it may be commissioned by running tests to verify that the system will operate properly. Additional commissioning may be required for building systems that contribute to the integrity, effectiveness, and soundness of an *alternative solution* and may involve:

- fire protection systems including:
  - fire alarm and detection systems
  - automatic sprinkler
  - standpipe
  - special suppression
- mechanical systems for:
  - smoke management
  - ventilation
  - pressurization
- electrical systems including:
  - emergency power
  - security
  - lighting
- egress and exiting paths, and
- supervisory staff protocols

STOP

Authority to Establish Conditions

The Code limits the criteria to be considered in the evaluation of an *alternative solution*:

> Div. A, Clause 1.2.1.1.(1)(b): "*...in respect of the objectives and functional statements attributed...*"

Only the "areas of performance" that are specified by the linked pairs of *objectives* and *functional statements* of the applicable Division B provision (*acceptable solution*) are permitted to be evaluated. A personal expectation of required "areas of performance" or level of performance is not permitted.

Judgment is required in considering the conditions for accepting an *alternative solution* with respect to its integrity (effectiveness).

For example, a proposed *alternative solution* dealing with the exit capacity from a floor area may rely on a certain limited occupant load of the floor area. However, the person having jurisdiction evaluating the *alternative solution* may have reason to believe that the floor area will not be supervised and that the limited occupant load could be exceeded during normal use.

In this case, the proposed *alternative solution* would meet the requirements of Div. A, Clause 1.2.1.1.(1)(b), but only with a limitation on occupant load that can only be controlled by supervised staff. The person having jurisdiction would be justified in withholding acceptance (refusal) for this proposed *alternative solution* if the applicant cannot provide sufficient evidence that appropriate supervision will be provided.

Service Life of an Alternative Solution

The Code does not state a minimum service life for designs that comply with Division B, nor does it state a minimum service life for proposed *alternative solutions*.

However it is clear that the Code intends that any Code-compliant design—using *acceptable* or *alternative solutions*—should perform as intended when the building is in use. Div. A, Sentence 1.2.2.1.(1) states that: "*All materials, appliances, systems and equipment installed to meet the requirements of this Code shall possess the necessary characteristics to perform their intended functions when installed in a building.*"

Not many building owners would want to implement a design that would fail after a short period of time. However, there may be some cases where the service life of a proposed *alternative solution* is unproven and is a matter of judgment, and these cases may require discussion with the applicant. Service life is not to be confused with maintenance (good repair) of the *alternative solution*.

STOP

Exercise 10-1 (Guided)

The proposed *alternative solution* in which the laundry exhaust duct is connected with a washroom exhaust duct has been evaluated and found to be in compliance with Div. A, Clause 1.2.1.1.(1)(b). The backpressure device (to prevent washroom exhaust from entering the laundry exhaust) is an important feature of this *alternative solution*. Are there any conditions that you would establish as part of the acceptance?

- A condition could be established that the backpressure device be provided with a rated access hatch and be inspected once every 6 months, and that the inspection frequency be documented in maintenance manuals.
- Another condition could be that an interlock mechanism be provided to ensure that the laundry exhaust fan (and laundry equipment) cannot run if the bathroom exhaust fan has failed.
- Another condition could be that the dryer be electric only and not gas or propane powered because the issue of venting products of combustion was not addressed by the Code Analysis.

These conditions limit the probability that the integrity or reliability of the *alternative solution* will be compromised. In other words, the conditions ensure that the *alternative solution* will perform as intended.

Exercise 10-2

A brief description of the subject of a proposed *alternative solution* is provided. Write any conditions that may be ***considered*** if the *alternative solution* is accepted.

The purpose of this exercise is to become familiar with thinking about what may be important to maintain the integrity (effectiveness) of an *alternative solution*.

For example:

> Scenario: A proposed *alternative solution* involves a door that swings contrary to the direction of exit travel for a large assembly room (that is, the door swings into the room).
>
> Possible conditions of acceptance:
>
> a. A limitation on occupant load.

1. A proposed *alternative solution* involves an innovative smoke management system.

   Possible conditions of acceptance:

   ____

   ____

2. A proposed *alternative solution* involves reduced fire-resistance rating requirements for the columns and roof of a storage warehouse.

   Possible conditions of acceptance:

   ____

   ____

3. A proposed *alternative solution* involves an unusual configuration for the access route and principal entrance of a long-term care facility due to the site geography.

   Possible conditions of acceptance:

   ____

   ____

4. A proposed *alternative solution* involves electromagnetic locking provisions that differ from Division B provisions.

   Possible conditions of acceptance:

   ____

   ____

Final Step
Acceptance
or Refusal
and
Document
Retention

Final Step: Acceptance or Refusal and Document Retention

Part of the process of accepting or refusing an *alternative solution* should involve the record of the decision.

A principal authority may have policies:

- prescribing the process for the assessment of an *alternative solution*,
- specifying the required documentation to support the acceptance or refusal of an *alternative solution*

While there is no legislative requirement under either the *Building Code Act* or the Building Code, to document decisions and retain records, from a risk management point of view it is highly advisable to do so. Consult the records retention by-law of the principal authority for the retention period of records. In case of a dispute, the person having jurisdiction should make a record of the decision to accept or refuse the use of an *alternative solution* along with the documentation in support of the request.

Documentation of Alternative Solutions

It is strongly suggested that you keep a record of your decisions that can be referenced in the future in order to:

- indicate the extent of information available at the time the decisions were made,
- capture decisions that were made during the plans review or change to permit information processes,
- demonstrate that the design or construction is in compliance with the applicable Code, and
- provide a record that you fulfilled your regulatory role as a Plans Examiner or Inspector.

Documentation (the record) is especially important for permits involving *alternative solutions* for the following reasons:

- **Process:** The Code requires the evaluation of specific "areas of performance" and confirmation of the level of performance. Documentation is the only way to confirm these processes were followed.
- **Record of decisions:** Documentation provides evidence that confirms the decisions and agreements that have been made, and provides a historical record of the design basis for the project. Some decisions and agreements may have been verbal and the information would be lost if not documented.
- **Conditions:** Conditions related to the use, occupancy, maintenance, operations, and protection features may vary for each building incorporating an *alternative solution*. Documentation of these conditions is necessary to ensure these are enforced and included in the assessment of future modifications to the building.

What Should You Keep On File?

Division C, Subsection 2.1.1. **specifies what needs to be**

- **submitted** by a person requesting the use of an *alternative solution* (e.g. the designer, architect, engineer or owner).

Division C, Subsection 2.1.1. **does not specify what needs to be**

- **retained** on file when an *alternative solution* is accepted or refused. A principal authority may have by-laws on the retention period of documentation relating to Building Department records.

Record to be Retained for an Alternative Solution (SUGGESTED)

- Submission form
- List of documents submitted in support of the *alternative solution*
- Copies of all documents submitted in support of the *alternative solution* (originals where possible)
- Correspondence relating to the *alternative solution*
- Evaluation Worksheet(s)
- Any other documentation that records the evaluation process, agreed-upon decisions, reasons for acceptance or rejection, and conditions for acceptance

Information that is relevant to establishing the level of performance and that influences the final decision should be kept on file.

The Code does not specify the length of time that documents should be retained. Verify the records retention by-law of the principal authority. It is recommended that Building Department records be maintained in perpetuity and hard copies microfilmed after seven years to save space.

STOP

Who Gets Notified of an Accepted Alternative Solution?

Depending on the nature of the *alternative solution*, it may be appropriate to notify other parties, in addition to the applicant, of the accepted *alternative solution*. Parties such as the Fire Department, Board of Health or Planning Department may expect a building design to comply with Division B unless otherwise notified. If they are aware of the *alternative solution* they will be able to consider this information when fulfilling their responsibilities on related issues for a particular building.

For instance, any *alternative solution* that involves fire department access or any *alternative solution* that may impact firefighting operations should be circulated to the Fire Department during the evaluation process and after acceptance. An *alternative solution* that involves sanitary facilities in a public building should be circulated to the Board of Health, to name a few.

A principal authority may already have or may develop policies stating that certain parties be informed and involved in the evaluation of *alternative solutions*.

Where are Documents Retained?

In addition to the documents and records that are kept by the principal authority, it may be appropriate for other parties, such as RCA's, owners and designers, to retain documentation of accepted and refused *alternative solutions*.

Division C of the Building Code does not specify where the record of an accepted *alternative solution* is required to be stored.

The following locations may be appropriate for the retention of documents or information relating to alternative solutions:

- **Fire Safety Plan**: This will alert emergency responders and building staff to any *alternative solution*.
- **Building Plans on File**: Many principal authorities have a repository of building plans, as-built drawings and specifications and information related to buildings and equipment. It may be appropriate to retain the documentation of an *alternative solution* in such a central location.
- **Building Owner/Property Manager**: Documentation of any *alternative solution* would assist these parties in making decisions that take into account the *alternative solutions*.

STOP

Summary

The key points of this module are:

- Step 10b involves establishing conditions of acceptance, which should address anything that may change the building and operational features necessary for the continuous successful implementation of the accepted *alternative solution*.
- The Final Step involves acceptance or refusal and issues related to document retention.

- **Documentation (record) that should be Retained for an Accepted or Refused Alternative Solution**
    - Submission Form
    - List of documents submitted in support of the *alternative solution*
    - Copies of all documents submitted in support of the *alternative solution* (originals where possible)
    - Correspondence relating to the *alternative solution*
    - Evaluation Worksheet
    - Any other documentation that records the evaluation process, agreed-upon decisions, reasons for acceptance or refusal, and conditions for acceptance
- Information that is relevant to establishing the level of performance and that influences the final decision should be kept on file.

Self-Assessment

As a result of this module, I am able to:

☐ Describe Step 10b and the Final Step in the evaluation process.

☐ Describe why conditions may need to be established for the acceptance of an *alternative solution.*

☐ Describe the documentation (record) of an *alternative solution*

Where Do We Go From Here?

This is the final module that covers new information in Ontario's 2006 Building Code. Next, you will have the opportunity to review the evaluation process of two guided case studies in Module 11, and then apply your newly acquired knowledge to other case studies in Module 12.

END OF MODULE 10

Module 11

Guided Case Studies

Introduction

This module will give you the opportunity to apply the procedure for evaluating a proposed *alternative solution*. Case Study 11-1 is guided in the workbook. You will have a chance to evaluate an *alternative solution* with the assistance of the facilitator in Case Study 11-2.

Evaluation Worksheet

A worksheet for the evaluation of *alternative solutions* has been completed for Case Study 11-1. The worksheet is an optional tool that can be used to summarize information and direct the evaluation. A blank "Worksheet for the Evaluation of *Alternative Solutions*" is included in Appendix 3 of this manual.

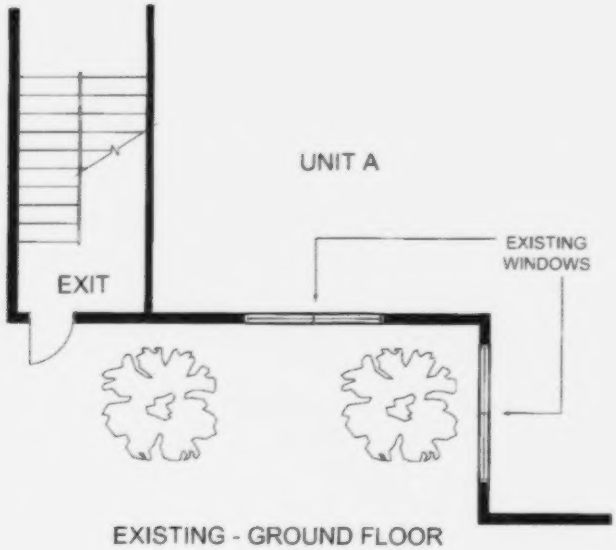
The evaluation worksheet provides space to summarize:

- project information and contacts
- the proposed *alternative solution*
- applicable Division B provisions
- linked pairs of *objectives* and *functional statements*, intent and application statements and "areas of performance"
- level of performance of Division B provisions
- level of performance of the proposed *alternative solution*
- the evaluation
- conditions of acceptance, if any
- circulation of the accepted *alternative solution*

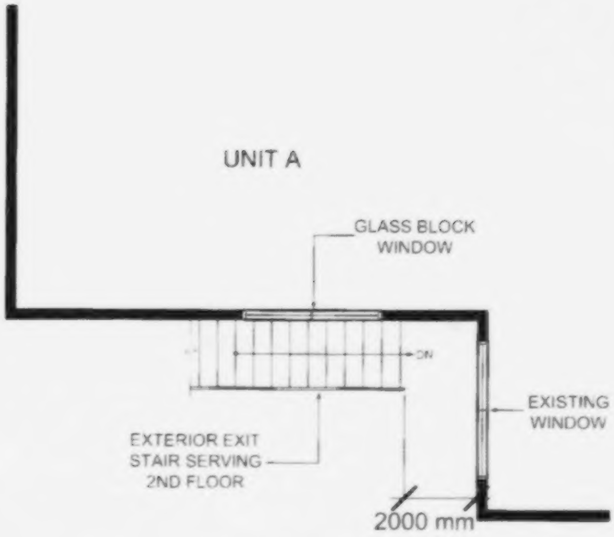
Case Study 11-1 – Exposure of an Unenclosed Exterior Exit Stair

This scenario was introduced in Module 8. A two-storey office building with a building area of 750 m^2 is being renovated. One of the interior exit stairs serving the second floor is being demolished and will be replaced with an unenclosed exterior exit stair.

The designer proposes to install glass block in the window opening w-1 that is adjacent to the new exit stair. He proposes to maintain the other window opening w-2 in conjunction with sprinklering the building.



EXISTING - GROUND FLOOR



PROPOSED

Figure 11-1: For proposed Alternative Solution, w-2 = existing window

PP TO FO P OPOS T T SO UT O - Sub itted by the pplicant

Project	Oak Hill Apartments, 120 Oak Street, w-2		
Proponent (Name, company, contact information, company)			**For Office Use Comments**
J.C. Doe			
XYZ Architects [BCDN 0000]			
Anytown, Province			
123 Main Street, (000) 000-0000			
Agent:	S. Smith, ABC Fire Protection Consultants, 10 – 80th Avenue (000) 000-0001		
Qualifications:	20 years fire protection design and analysis	BCIN 00000	

Summary of Proposed Alternative Solution

Maintain an unprotected opening within 2 m of an unenclosed exterior exit stair and fully sprinkler the building. It is proposed that the level of performance established by the Code is the level of exposure at a 3 m distance from an unprotected window in an unsprinklered building with a high fuel load. The level of exposure from a window in a sprinklered building will be much less.	

Applicable Division B Provisions

Sentence	Summary of Provision	
3.2.3.13.(2)	Openings within 3 m horizontally and less than 10 m below or 5 m above an unenclosed exterior exit stair require protection in accordance with Sentence (4).	
3.2.3.13.(4)	Protection is required to be provided by glass block, wired glass or a rated closure.	

Applicable Objectives and Functional Statements

Sentence	Functional Statement	Objective	Level of Performance Established in Submission Documentation (yes/no)		
			Division B	Proposed Alternative Solution	
3.2.3.13.(2)	see below	see below	-	-	
3.2.3.13.(4)	F06	OP1.2	yes	yes	
	F05	OS1.2	yes	yes	
	F06	OS1.2	yes	yes	

Supporting Documentation

	Author	Title of documentation	
1	ABC Fire Protection Consultants	Code Analysis	
2	ABC Fire Protection Consultants	Engineering Analysis of Fire Exposure of Exit Stair	
3	S. Smith	Résumé for S. Smith	

Step 1 – Receive Application Conforming to Div. C, Clauses 1.3.1.3.(5)(a) to (e)

1
Start
*R*eceive
Application

The following documents are submitted to the Building Department with the building permit application:

- submission form
- drawings for the project
- Code Analysis
- engineering analysis of fire exposure of exit stair
- résumé for the proponent/applicant

The applicable fees are paid.

> ➢ A quick review of this application package shows that the required elements of the application are included, and the evaluation can proceed.

2
Confirm Compliance to Other Division C Provisions

Step 2 – Confirm Compliance with Other Division C Provisions

A Code Analysis has been submitted. Since reviewing a complete Code Analysis is beyond the scope of this course, only the table of contents is reprinted below. The checklist confirming compliance with Division C is on the next page.

Office Building – Exit Stair Exposure

Code Analysis Prepared by ABC Fire Protection
Table of Contents

Introduction p1
Summary of Proposal p2
Qualifications and Experience p3
Applicable Division B Provisions p5
Objectives and *Functional Statements* p5
Levels of Performance
    Division B p6
    Proposed *Alternative Solution* p7
    Comparison p8
Summary of Assumptions and Limitations p9
Summary of Special Operation and Maintenance Requirements p10
Conclusion p11

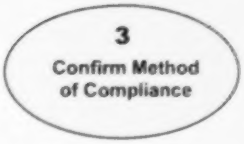
Sample Checklist for Submission Information
For Use by a Principal Authority or RCA

(based on Division C, Section 2.1.)

Required for Submission of a Proposed Alternative Solution			Submitted (yes/no)
1	A description of the proposed alternative solution [Div. A, 1.2.1.1.(1)(b)]		Yes
2	Proponent(s) name, company, address, contact information		Yes
3	Designer's qualification appears on Schedule 1 When proponent is an Architect, indicate BCDS qualifications under the *Architect's Act*		Yes
4	Code Analysis (documentation under Div. C, Article 2.1.1.1.) Establish on the basis of past performance, tests described in Div. C Article 2.1.1.2., or other evaluation that the proposed *alternative solution* will achieve the level of performance required under Div. B, by way of Div. A, Article 1.2.1.1.		Yes
	A	Identification of applicable Division B provisions (*acceptable solutions*)	Yes
	B	Identification of applicable linked pairs of *objectives* and *functional statements*	Yes
	C	An evaluation of the level of performance of applicable Division B provisions	Yes
	D	An evaluation of the level of performance of the proposed *alternative solution*	Yes
	E	Identification of any assumptions, limiting or restricting factors	Yes
	F	Identification of testing procedures, engineering studies, building performance parameters etc… to support the assessment for compliance	Yes
5	Information concerning any special maintenance or operation requirements, including commissioning, necessary for the integrity of the *alternative solution* after construction is complete		Yes
	Optional items that would be helpful in the review		
6	A list of submitted documents: These could include a concept report, calculations, fire modeling, test reports, precedents, fire scenario evaluation, alternate Codes and standards, drawings, etc …		Yes
7	A reason for the proposed *alternative solution*.		No
8	A list of applicable sections of referenced documents (standards).		N/A
9	Résumé of designer with details of qualifications		Yes
10	Other: (specify)		

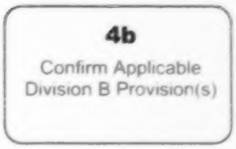
- ➢ All required elements of the application have been submitted. Proceed to Step 3.

Step 3 – Confirm Method of Compliance Under Division A, Sentence 1.2.1.1.(1)



- The applicant has indicated in the submission that the proposed method of ***compliance for the unenclosed exterior exit stair is using alternative solutions*** under Division A, Clause 1.2.1.1.(1)(b).
- There are no other issues identified as *alternative solutions*, and as such, it is assumed that the proposed method of compliance ***for the remainder of the design will be using acceptable solutions*** under Division A, Clause 1.2.1.1.(1)(a). This would be analyzed separately.

Step 4b – Confirm Applicable Division B Provisions

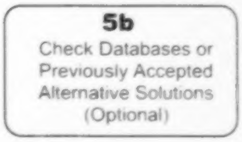


The applicant has identified the primary issue as the exposure of the unenclosed exterior exit stair. The applicable Division B provisions are reported to be:

- Sentence 3.2.3.13.(2)
- Sentence 3.2.3.13.(4)

- These provisions are applicable to the situation and there are no other applicable provisions that need to be evaluated for the proposed *alternative solution*.

Step 5b – Check Databases (optional)


5b
Check Databases or Previously Accepted Alternative Solutions (Optional)

- For the purpose of this case study, it is assumed that a database solution is not available.

6b
Confirm Applicable Objectives & Functional Statements

Step 6b – Confirm Applicable Linked Pairs of Objectives and Functional Statements

The applicant has identified the linked pairs of *objectives* and *functional statements* on the submission form. In this step, these are confirmed and the "areas of performance" are determined.

- The applicable *objectives* and *functional statements* can be confirmed by consulting Attribution Table 3 in Supplementary Standard SA-1.
- Note that Sentence 3.2.3.13.(2) does not have any linked pairs of *objectives* and *functional statements* because it is not a requirement in itself. It directs the application of Sentence 3.2.3.13.(4).
- Note that *functional statement* F06 is "To retard the effects of fire on facilities for notification, suppression and emergency response." Since the function of an unenclosed exterior exit stair does not contribute to notification or suppression, these words were removed to better focus the "areas of performance".
- In summary, the "areas of performance" to be evaluated are [F06-OP1.2] [F05-OS1.2] [F06-OS1.2] and can be paraphrased as:

For [F06-OP1.2] [F06-OS1.2]

To retard the effects of fire on the unenclosed exterior exit stair for emergency response so that:

- it is not damaged by fire spread beyond its point of origin, and
- emergency responders using it are not injured by fire spread.

For [F05-OS1.2]

To retard the effects of fire on the unenclosed exterior exit stair so that:

- people using it are not injured by fire spread.

Step 7b – Confirm Level of Performance of Applicable Division B Provision(s)

7b
Confirm Level of Performance of Applicable Division B Provision(s)

Since this Code provision is prescriptive, we can ask questions and use our judgment and experience to determine the level of performance of the Division B provision (*acceptable solution*).

- In summary, the Division B provision requires that any opening within 3 m horizontally be protected when located less than 10 m below or less than 5 m above the unenclosed exterior exit stair.
- We know that fire spread from a fire compartment to the unenclosed exterior exit stair is the initial consequence that the Code provision is addressing.
- We know that the negative outcomes to be avoided are harm to persons and damage to the building from fire spread and harm to persons from delayed evacuation or impeded emergency response.
- Fire spread may occur by direct flame contact or by heat radiation. The fire spread is considered to include fire spread to the unenclosed exterior exit stair as well as possible heat or flame exposure to occupants or firefighters who may use the said exterior exit stair.

1. **Asking questions may help determine the level of performance of the Division B provision:**

How does the provision reduce the risk of undesirable consequences?

- The provision requires a minimum horizontal distance of 3 m from an unprotected opening located less than 10 m below or less than 5 m above the said stair which reduces the risk of high radiant heat and flame contact with the stair.

Is there anything else in the Code that allows an exception in this situation?

- There are no exceptions to this provision in Part 3. Division B, Part 9, Sentence 9.9.4.4.(1) permits unprotected openings to expose an unenclosed exterior exit stair if it is not the only means of egress; however, this building is governed by Part 3.

Are there any factors that would affect the level of performance but are not regulated by this or other provisions of Division B of the Code?

- The spread of fire to the unenclosed exterior exit stair will be affected by the following factors that are not regulated by the Code for Div. B, Article 3.2.3.13.:
    - fuel load (combustible content) in the fire compartment
    - size of the fire compartment
    - sprinkler protection in the fire compartment
    - size of the unprotected opening
- None of these factors are considered in the application of Sentence 3.2.3.13.(4). However, these factors have a great influence on the level of performance of the spread of fire to an unenclosed exterior exit stair within 3 m from an unprotected opening located less than 10 m below or less than 5 m above the said exit stairs.

If a number in the text of a provision (such as a distance measurement) were increased or decreased, what impact would it have on the level of performance (risk of fire spread) and in what way?

- At 3.01 m horizontally, the provision does not apply. Similarly, the provision does not apply to window openings that are less than 3 m horizontally and 10 m or more below or 5 m or more above the said exit stair. At 3 m horizontally from a window opening located less than 10 m below or less than 5 m above the unenclosed exterior exit stairs, the provision applies as there is a chance of fire spread via direct flame contact and heat radiation that could ignite a combustible stair and expose the occupants as they evacuate. If the horizontal measurement was to be decreased to less than 3 m and the vertical distances to less than 10 m and 5 m respectively, there would be higher temperatures at the stair and the potential for direct flame contact and radiant heat would increase accordingly.

What is the level of performance of a design makes this provision apply?

- The level of performance that makes this provision apply is an unenclosed exterior exit stair that is 3 m from a window opening located less than 10 m below or less than 5 m above the said exit stair. Depending on the size of the fire compartment, the fuel load and the absence or presence of sprinklers, a fire could result in a high heat exposure at 3 m away from a window opening.

2. Qualitative (Descriptive) Statement of Level of Performance:

- The risk of fire spread between window openings in the building and an unenclosed exterior exit stair is minimized by requiring horizontal and vertical clearance or protection on windows. These measures reduce the risk of direct flame contact and exposure to radiant heat. The Code does not contain specific information that explains why 3, 10 and 5 m are the minimum clearance distances. The protection of window openings is prescribed.

- Since the conditions contributing to the exposure can vary widely, the level of performance is established by a design that conforms to Division B ***and*** by the conditions that would lead to the highest potential heat or flame exposure.

3. Quantitative (Numerical) Statement of Level of Performance:

- This may be established by the applicant in the engineering analysis by calculating the radiant heat as experienced 3.01 m away from a large unprotected opening for an unsprinklered fire compartment. The applicant may also calculate the possibility of direct flame contact at 3.01 m.

- The person having jurisdiction would be responsible for deciding whether the input data, assumptions and limitations, qualifications of the proponent, and methodology of the analysis are acceptable, and for deciding if the proposed level of performance of the *alternative solution* makes sense.

A third party/peer review may be necessary to verify mathematical models and calculations.

Step 8b – Confirm Level of Performance of the Proposed Alternative Solution(s)

8b
Confirm Level of Performance of Proposed Alternative Solution(s)

The applicant has submitted an engineering analysis of the fire exposure of the unenclosed exterior exit stair in the proposed *alternative solution*.

- The Code analysis includes a mathematical calculation of the level of heat radiation from the proposed unprotected window with the following factors:
    - the actual size of the fire compartment,
    - the actual fuel load (combustible content) of the office occupancy, and
    - the effect of sprinkler protection in reducing exposure to flames and radiant heat

The person having jurisdiction would be responsible for confirming the input data, assumptions and limitations, qualifications of the proponent, and methodology of the analysis. A third party/peer review may be necessary to verify mathematical models and calculations.

Step 9b – Compare Levels of Performance

9b
Compare Levels of Performance

- The person having jurisdiction reviewing this application may conclude that the level of performance of this proposed *alternative solution* is greater than the level of performance required by the Code under Div. B, Sentence 3.2.3.13.(4) **or** greater than an opening without protection that is located 3.01 m horizontally from an unenclosed exterior exit stair. Therefore the proposed *alternative solution* would meet Div. A, Clause 1.2.1.1.(1)(b).

10b
Establish Conditions of Acceptance if any

Step 10b – Establish Conditions of Acceptance, if any

- The level of performance of the *alternative solution* depends on the following factors:
    - the design fire load for the building, and
    - the size and proximity of the window opening
- Therefore, the building must be maintained as an office building and window opening w-2 must not be enlarged.
- The *alternative solution* should be documented in the Fire Safety Plan so the Fire Department is aware of the *alternative solution* since the configuration may impact firefighting operations.
- Regular maintenance and testing of the sprinkler system is not included in the conditions since this is already regulated by the Fire Code.

Final Step
Acceptance or Refusal and Document Retention

Final Step – Acceptance or Refusal and Document Retention

- Documents that should be retained include the entire submission package, records of any phone discussions or meetings, all review work sheets, evaluations and a record of the decision made by the person having jurisdiction to allow (accept) the use of the *alternative solution*.
- The Fire Department should be notified of the accepted *alternative solution* since the configuration may impact firefighting operations.

WORKSHEET FOR THE EVALUATION OF ALTERNATIVE SOLUTIONS

Completed by the Person Responsible for the Evaluation of the Proposed Alternative Solution

Project Information and Contacts

Owner/Designer/Agent:

J.C. Doe, XYZ Architects, 123 Main Street, (000) 000-0000 [BCDN 0000]
S. Smith, ABC Fire Protection Consultants, 10 – 80th Avenue, (000) 000-0001 [BCIN 00000]

Qualifications:
S. Smith, P.Eng., BCIN OOOOO, 20 years fire protection design and analysis

Summary of Proposal

To maintain an unprotected opening within 2 m of an unenclosed exterior exit stair and to sprinkler the building. It is proposed that the level of performance established by the Code is the level of exposure at a 3 m distance from an unprotected window in an unsprinklered building with a high fuel load. The level of exposure from a window in a sprinklered building will be much less.

Applicable Division B Provisions

Sentence	Provision
3.2.3.13.(2)	If an unenclosed exterior exit stair or ramp could be exposed to fire from an opening in the exterior wall of the building it serves, the opening in the exterior wall of the building must be protected in conformance with the requirements of Sentence (4) where the opening in the exterior wall of the building is within 3 m horizontally and (a) less than 10 m below the exit stair or ramp, or (b) less than 5 m above the unenclosed exterior exit stair or ramp.
3.2.3.13.(4)	The window opening protection referred to in Sentence (2) shall consist of (a) glass block conforming to the requirements of Article 3.1.8.14., (b) a wired glass assembly conforming to Supplementary Standard SB-2 or (c) a closure conforming to the requirements of Subsection 3.1.8. and Articles 3.2.3.1. and 3.2.3.14.

Objectives / Functional Statements / Areas of Performance

Sentence	F.S.	Obj.	Summary of "Areas of Performance"	Applicable?
3.2.3.13.(4)	6	OP1.2	To retard the effects of fire on the unenclosed exterior exit stair for emergency response so that it is not damaged by fire spread beyond its point of origin.	yes
	6	OS1.2	To retard the effects of fire on the unenclosed exterior exit stair for emergency response so that emergency responders using it are not injured by fire spread.	yes
	5	OS1.2	To retard the effects of fire on the unenclosed exterior exit stair so that people using it are not injured by fire spread	yes

Confirmation of Level of Performance of:

Applicable Division B Provisions What is the level of performance of the applicable Division B provision in the "areas of performance" derived from the linked pairs of *objectives* and *functional statements*?"	**Proposed Alternative Solution** • What is the level of performance of the proposed *alternative solution* that is established by the applicant? • Does the supporting documentation adequately support this level of performance?" • Do you agree with the established level of performance?
• Distance of 3 m kicks in the provision to reduce risk of fire spread (flame, radiation) • Many factors that influence fire spread are not regulated by the Code for this situation: fuel load, size of compartment, sprinkler protection, size of unprotected opening • Level of performance that meets Division B is based on protection of window without regard to size of opening, high fuel load and presence of sprinklers in the building • Potential radiation exposure at 3 m is x kW/m^2	• In this building, window is x m^2, fuel load is x kW/m^2, building is sprinklered • Using radiation calculations and verified by computer modeling, the potential radiation exposure at 2 m is x minus kW/m^2 • Qualifications of author are relevant and substantial • Input data, conclusions, methodology verified to be suitable

Evaluation:

Level of performance of the alternative solution exceeds level of performance of the Division B provisions based on submitted design fire load and radiation calculations.

Conditions of Acceptance

1. Maintain use and occupancy as a general business office (Group D).
2. The window opening exposing the unenclosed exterior exit stair must not be enlarged.
3. The *alternative solution* must be documented in the Fire Safety Plan

Circulation of Accepted Alternative Solution

Proponent	X	Province		Other (specify)	
Chief Building Official	X	Central Registry			
Inspector	X	File	X		
Fire Department	X	Owner	X		
Accepted By:		BCIN 00000		Date:	

Case Study 11-2 – Public Corridor With a Reduced Width

Scenario: A 3 storey mill building, with a building area of 580 m^2, is being renovated and converted to residential units. Two loadbearing masonry walls run the length of the building and will form the walls of the new public corridor. The walls will provide a clear width between them of 890 mm except at the entrances to the dwelling units where the corridor will be widened to 1500 mm. **On Figure 13-2, change 900 to 890**.

The architect is proposing to maintain a 890 mm width for the public corridor on each floor. Large windows in each unit will be removable for large furniture. There is no elevator service to the 2nd and 3rd floors; however, the ground floor entrances are barrier-free.

Task: Follow the suggested procedure to evaluate the proposed *alternative solution*.

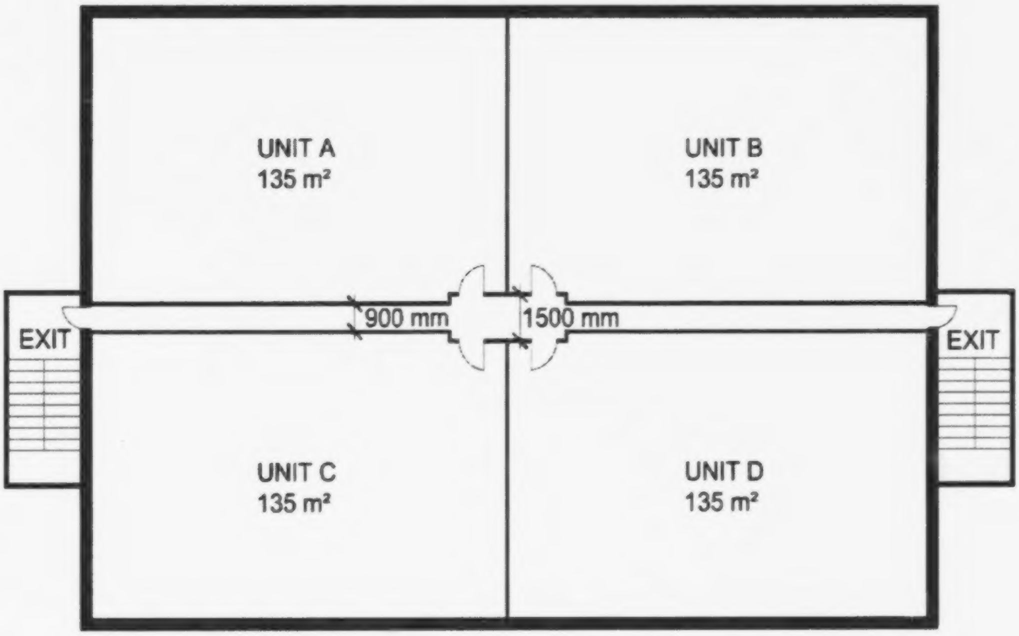


Figure 11-2: Sketch of 2nd Floor – Old Mill Condominiums

The following application has been submitted:

APPLICATION FOR PROPOSED ALTERNATIVE SOLUTION - Submitted by the Applicant

Project	Old Mill Condominiums, 12 Mill Street, public corridor		
Proponent (Name, company, contact information, company)			**For Office Use Comments**
B. Jones			
ABC Consultants			
Anytown, Province			
(000) 000-0002 bjones@abc.com			
Agent	N/A		
Qualifications	15 years life safety consultant	BCIN 00000	

Summary of Proposed Alternative Solution

To provide a 890 mm wide public corridor between the existing load-bearing masonry walls.	

Applicable Division B Provisions

Sentence	Summary of Provision	
9.9.3.3.(1)	Public corridors are required to have a minimum width of 1100 mm.	
9.5.2.1.(1) → 3.8.		
3.8.1.3.(1),(4)	A barrier-free path of travel must be at least 1 100 mm wide for the passage of wheel chairs and must have unobstructed spaces of not less than 1 600 mm x 1 600 mm located not more than 30 m apart	

Applicable Objectives and Functional Statements

Sentence	Functional Statement	Objective	Level of Performance Established in Submission Documentation (yes/no)		
			Division B	Proposed Alternative Solution	
9.9.3.3.(1)	F30	OS3.1	Yes	Yes	
	F10	OS3.7	Yes	Yes	
9.5.2.1.(1) →					
3.8.1.3.(1),(4)	F73	OA1	Yes	Yes	

Supporting Documentation

	Author	Title	
1	ABC Consultants	Code Analysis	
2	XYZ Architects	Set of Drawings	
3			
4			

Step 1 – Receive Application Conforming to Div. C, Clause 1.3.1.3.(5)(a) to (e)

A quick check is done to make sure the application form is completed, the drawings and other documentation is attached, and the fees are paid.

Step 2 – Confirm Compliance with Other Division C Provisions

A set of drawings and a Code Analysis have been submitted as indicated on the submission form. Evaluation of a complete Code Analysis is not within the scope of this course.

1. Describe what you will do with this application to complete Step 2.

   ____

   ____

   ____

2. From your basic review, does the submission meet Division C requirements?

   ____

3. Would you request any additional information from the applicant at this stage?

   ____

Step 3 – Confirm Method of Compliance Under Div. A, Sentence 1.2.1.1.(1)

1. What method of compliance is the applicant proposing for the width of the public corridor?

   ____

2. What method of compliance is being used for other features of the renovations?

   ____

Step 4b – Confirm Applicable Division B Provisions

Division B, Sentence 9.9.3.3.(1) is indicated on the application form.

1. Is this provision applicable to the proposed *alternative solution*?

   ____

   ____

2. Are there any additional applicable provisions (hint: the ground floor entrances are barrier-free)?

   ____

   ____

Step 5b – Check Databases (Optional)

For the purpose of this case study, it is assumed that a database solution is not available.

Step 6b – Confirm Applicable Objectives and Functional Statements

The proponent has identified the applicable linked pairs of *objectives* and *functional statements*; always confirm these and determine the "areas of performance". For this case study, the "areas of performance" have been provided, consult them. If they had not been provided, you could have used the sample worksheet found in Appendix 3 to determine the "areas of performance".

Applicable Provisions	FS	OBJ	Functional Statement		LINK	Objective	
			To <function>	What/from		People/ building	Not <harmed> due to OR can <action>
9.9.3.3.(1)	30	OS3.1	To minimize the risk of injury to persons as a result of contact or collision		*so that*	a person in the use of a building will not be exposed to an unacceptable risk of injury due to hazards caused by contact or collision	
	10	OS3.7	To facilitate the timely movement of persons to a safe place in an emergency		*so that*	a person in the use of a building will not be exposed to an unacceptable risk of injury due to hazards caused by persons being delayed or impeded from moving to a safe place during an emergency	
3.8.1.3.(1) and (4)	73	OA1	To facilitate circulation in the building by persons with physical or sensory disabilities		*so that*	a person with a physical or sensory disability will not be unacceptably impeded from circulating within the building	

Step 7b – Confirm the Level of Performance of Applicable Division B Provision(s)

The questions below are intended to help you start thinking about the level of performance of a Division B provision and should lead to its description in qualitative and quantitative terms.

1. Summarize the "areas of performance" that need to be evaluated from the linked pairs of *objectives* and *functional statements* (from Step 6b).

2. How do the provisions reduce the risk of the undesirable consequences?

3. Are there other Division B Code provisions that permit exceptions that would decrease the level of performance?

4. Are there any factors that would affect the level of performance and that are not regulated by the provision or the Code?

5. If a number in the provision (e.g. width) was increased or decreased, how would this impact the level of performance of a regular public corridor and one that is in a barrier-free path of travel?

6. What is the level of performance of a non barrier-free public corridor system that complies with the Code provisions?

7. Write a qualitative statement for the level of performance of a 900 mm wide public corridor that considers Sentence 9.9.3.3.(1) and CA C106b for the second and third floor and Sentence 3.8.1.3.(1) for the ground floor.

8. What kind of analysis or study might be submitted if an applicant was to assign a quantitative (numerical value) level of performance to these provisions?

Step 8b – Confirm Level of Performance of Proposed Alternative Solution(s)

1. What would you expect to see in the Code Analysis with respect to the level of performance of the 890 mm wide public corridor?

2. What might ***the applicant propose*** as the level of performance for the 890 mm wide public corridor of this building with respect to…

   - emergency evacuation?

   - occupants colliding with one another or the building?

   - **persons on the first storey** with physical or sensory limitations from being able to circulate without assistance?

Step 9b – Compare Levels of Performance

1. Compare the level of performance of Sentence 9.9.3.3.(1)/CA C106b with that of the proposed *alternative solution* for 890 mm wide public corridor.

2. Compare the level of performance of Sentences 3.8.1.3.(1) and (4) with that of the proposed *alternative solution* for the 890 mm wide public corridor on the ground floor, with an unobstructed space 1500 mm wide.

Step 10b – Establish Conditions of Acceptance, if any

Assume the proposed *alternative solution* for the 890 mm wide public corridor on the second and third storey and the 890/1500 mm wide public corridor on the first storey has been evaluated and is considered to be in compliance with Div A., 1.2.1.1.(1)(b) by the person having jurisdiction. Are there any conditions you would establish as part of the acceptance?

1. ______________________________

Final Step – Acceptance or Refusal and Document Retention

Assume the proposed *alternative solution* for the 890/1500 mm wide public corridor has been deemed to be in compliance with Div A., 1.2.1.1.(1)(b) by the person having jurisdiction.

1. What documents should be retained for the *alternative solution*?

2. Are there any other parties who should be notified of the *alternative solution*?

3. What locations other than the Building Department repository of plans should keep a record of the *alternative solution*?

Where Do We Go From Here?

Module 12 contains case studies that you can use to apply your new knowledge.

END OF MODULE 11

Module 12

Case Studies

Introduction

This module provides an opportunity to use the 2006 Code with proposed *alternative solutions*. ***The two case studies are intended to give you practice in the process of evaluating a proposed alternative solution.***

A real-life submission and evaluation of an *alternative solution* could involve many documents and many hours of effort. This course is intended as an introduction to the objective-based code and an introduction to the process of evaluating a proposed *alternative solution*.

The full technical details of each case study are ***not*** provided so you can concentrate on the process you would follow, rather than on the technical evaluation. Note technical issues that would require further investigation, but do not get "stuck" on technical issues! Make assumptions if required to proceed with the evaluation.

There is no "ultimate right" answer in the evaluation of an *alternative solution*. Each situation may be unique, and there are many factors specific to each situation that may affect the evaluation.

The answer guide for the case studies includes a sample basic evaluation and suggestions for what might need to be investigated further. You will likely think of additional issues that need to be considered and investigated.

Use the Tools

Use the suggested procedure for the evaluation of *alternative solutions* and any or all of the support tools in this workbook:

- Flow chart for Applying the 2006 Code (pages 3-3 and 7-3 and Appendix 6)
- Worksheet for the Evaluation of *Alternative solutions* (Appendix 3)
- Sample Checklist of Submission Requirements (Appendix 3)

Guidelines for the Case Studies

- Make assumptions where necessary to proceed with the evaluation.
- Ask the facilitator/instructor for assistance if you have questions about the process.
- Do not get "stuck" on technical details. Identify the issue(s) that would need further investigation and identify what you would expect to see submitted for that issue(s).
- Since a submission is not actually presented a detailed comparisons of levels of performance will not be possible. In this case, indicate what you might do if you had all the information.
- You may wish to discuss what questions you should ask for an evaluation of the Levels of Performance.
- At Step 10b, assume that the *alternative solution* satisfies Division A, 1.2.1.1.(1)(b) and determine what conditions might be established.

List the documents that should be retained.

CASE STUDY 12-1 – Open Stair Between Storeys in a Heritage Building

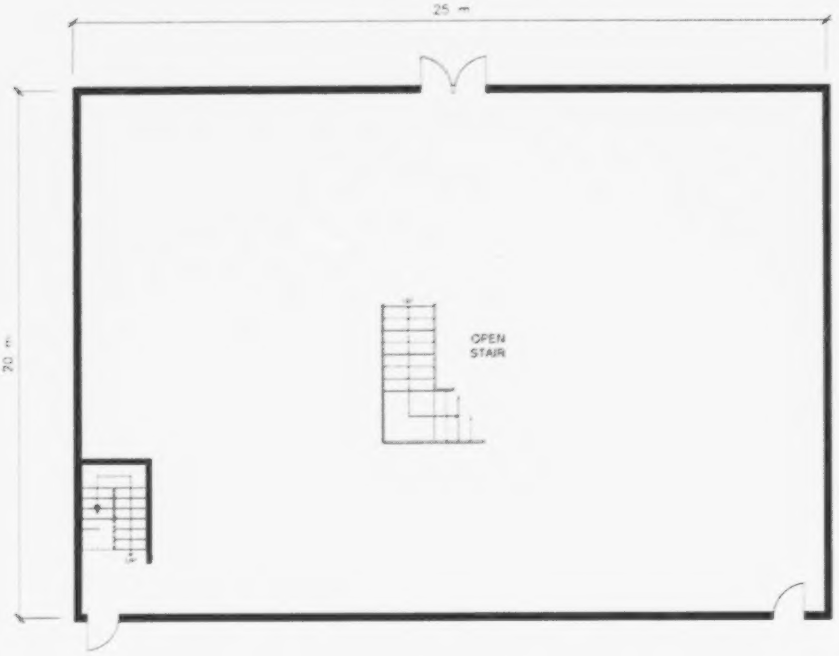
Scenario - A community group owns a run-down heritage building. The group has secured the funds to renovate the building and operate a public museum within the building. The building is two storeys, combustible construction and unsprinklered. The building is 20 m by 25 m and has a building area of 500 m^2.

The central unenclosed feature stair has significant heritage value. The group would like to retain it, and an architect has proposed an *alternative solution* in order to maintain the central feature stair. The *alternative solution* consists of sprinklering the building (although it is not required by Division B) and enclosing the second stair that currently provides egress from the second floor.

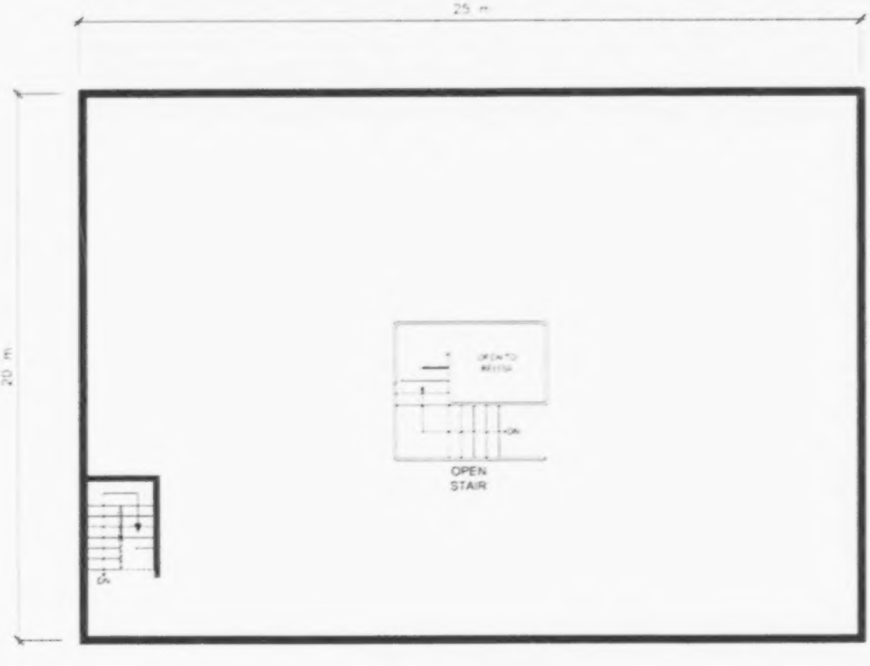
Task: Evaluate the proposed *alternative solution* based on the provided information and decide whether you would approve the proposal or what additional information you would request.

NOTE: For purposes of this case study, do not consult Part 11. As a matter of fact, since the proposed occupancy would be an assembly occupancy, the use of *Compliance Alternatives* could only be substituted for a Division B provision if the Chief Building Official was satisfied that compliance with the requirement was impracticable because of structural or construction difficulties or was detrimental to the preservation of a *heritage building*. Also take note that Alternative Measures no longer form part of Part 11 now that we have *alternative solutions*.

Also, for the purposes of this example, you should concentrate on the issue of the open stair notwithstanding that 2 exits are required. This case study is presented simply to illustrate the application of the process.



GROUND FLOOR
PROPOSED MUSEUM



SECOND FLOOR
PROPOSED MUSEUM

PP TO FO ALTERNATIVE SOLUTION S STU 1 -1

		For Office Use o ents
Proponent (Name, company, contact information, company)		
T. Connor, LMN Architects	BCDS 0000	
Address		
Anytown, Canada		
Phone Numbers Email address	BCIN OOOOO	
gent	B. Jones, XYZ Fire Protection	
ualifications	LMN: 20 years of renovating historic buildings XYZ: 12 years fire protection engineering	BCIN OOOOO

Summary of Proposed *Alternative solution*

Maintain an open feature stair in a heritage building. A sprinkler system will be installed in the building and the second stair will be enclosed with a 45 minute rated fire separation.

Applicable Division B Provisions

Sentence	Summary of Provision
3.2.2.25.(2)(a)	Floors are required to be fire separations (45 minute rating if combustible construction)
3.4.4.1.(1)	Exits are required to be 45 minute rated fire separations.

Applicable *Objectives* and *Functional statements*

Sentence	Functional statement	Objective	inimum Performance evel stablis ed in Submission ocumentation yes no	
			ivision	Proposed Alternative solution
3.2.2.25.(2)(a)	F03	OP1.2	Yes	Yes
	F04	OP1.2	Yes	Yes
	F04	OP1.3	Yes	Yes
	F03	OS1.2	Yes	Yes
	F04	OS1.2	Yes	Yes
	F04	OS1.3	Yes	Yes
3.4.4.1.(1)	F03	OS1.2	Yes	Yes
	F06	OS1.2	Yes	Yes
	F05	OS1.5	Yes	Yes
	F06	OS1.5	Yes	Yes
	F03	OP1.2	Yes	Yes
	F06	OP1.2	Yes	Yes

Supporting Documentation

	ut or	itle
1	LMN Architects	Code Analysis
2	XYZ Fire Protection	Fire Scenario Analysis
3	Conner, Jones	Résumés

CASE STUDY 12-2 – New Subflooring Material for Houses

Scenario

A new type of subflooring made of plastic is being marketed for use in houses. This is proposed to be used in floors that are:

a) not required fire separations, and

b) have equivalent fire performance to traditional wood frame and wood-based subflooring.

The plastic subflooring meets the flame spread requirements of the Code for interior finish. Assume that issues of grain orientation are not applicable to plastic subflooring, and that conventional edge support will be provided.

Task: Evaluate the proposed *alternative solution* based on the provided information and decide whether you would approve the proposal or what additional information you would request.

PP TO FO ALTERNATIVE SOLUTION S STU 1 -

Proponent (Name, company, contact information, company)			For Office Use o ents
B. Brown, XYZ Construction Products			
Address			
Anytown, Canada			
Phone Numbers Email address			
gent	E. Anderson, ABC Engineering	BCIN OOOOO	
ualifications	E. Anderson, 12 years structural analysis of building products	BCIN OOOOO	

Summary of Proposed *Alternative solution*

To install plastic subflooring panels in single family dwelling units.	

Applicable Division B Provisions

Sentence	Summary of Provision	
9.23.14.5.(1)	Wood-based subfloor panels to conform to tables.	
9.23.14.2.(1)(c)	CSA-O153, "Poplar Plywood"	

Applicable *Objectives* and *Functional statements*

Sentence	Functional statement	Objective	inimum Performance evel stablis ed in Submission ocumentation yes no		
			ivision	Proposed Alternative solution	
9.23.14.5.(1)	F22	OH4	Yes	Yes	
	F22	OP2.4	Yes	Yes	
	F22	OS3.1	Yes	Yes	
	F20	OS2.1	Yes	Yes	
9.23.14.2.(1)(c)	F22	OH4	Yes	Yes	
	F22	OP2.4	Yes	Yes	
	F22	OS3.1	Yes	Yes	
	F20	OS2.1	Yes	Yes	

Supporting Documentation

	ut or	itle	
1	XYZ Construction Products	Code Analysis	
2	ABC Engineering	Structural analysis and comparison of plywood subflooring and plastic subflooring	
3	Other Principal Authority	Acceptance by another principal authority	
	E. Anderson	Résumé	

Appendix 1

Glossary

Glossary

This Glossary is intended to be a quick reference for terms used in the 2006 Code and in the training materials. Terms that are defined in Division A, Clause 1.4.1.2.(1)(b) appear in *italics*. Terms that are not defined in the Code and explanations appear in regular character.

Acceptable solution	*means a requirement stated in Parts 3 to 12 of Division B.* *Acceptable solutions* are the benchmark that *alternative solutions* are evaluated against. [See Div. A, Clause 1.2.1.1.(1)(b)]
Alternative solution	*means a substitute for an acceptable solution.* *Alternative solution* is the new term for an equivalent under the 1997 Code. A proposed *alternative solution* is any proposed product, material, component, design, system, equipment, or procedure that does not comply with the applicable provisions of Division B, known as *acceptable solutions*. To comply with the 2006 Code under the compliance option of Division A, Clause 1.2.1.1.(1)(b), a proposed *alternative solution* must perform *at least as well as* the applicable provisions of Division B, *acceptable solutions*. It must be shown that the proposed *alternative solution* achieves at least the level of performance required by Division B, in the "areas of performance" derived from the linked pairs of *objectives* and *functional statements* attributed to the applicable *acceptable solutions* in Supplementary Standard SA-1. [See Attribution, "areas of performance", *objective* and *functional statement*]
Applicable *Acceptable solution*	An applicable *acceptable solution* is the provision or set of provisions in Division B that would have to be satisfied if the design were to comply with Division B. In other words, an applicable Division B provision is a code provision that would be satisfied if the design were to comply with Division B. An *acceptable solution* (applicable Division B provision must be identified for each proposed *alternative solution*, for purposes of comparing their level of performance.
"areas of performance"	The "area of performance" indicates what to evaluate for a proposed *alternative solution*. A proposed *alternative solution* must be compared to the applicable *acceptable solution* in Division B. Each Division B requirement is

linked to at least one *objective* and one *functional statement* called a pair. Each linked *objective* and *functional statement* pair is an "area of performance".

Each "area of performance" describes what needs to be done (the function) and why (the *objective*).

An *acceptable solution* may have several "areas of performance" linked to it. A proposed *alternative solution* must perform in each of these "areas of performance".

Attribution

An attribution is a linked pair of one *objective* and one *functional statement*. Each Division B provision is linked to at least one attribution in the Attribution Tables of Supplementary Standard SA-1.

Attribution Table

The attribution tables for each Part of Division B are found in Supplementary Standard SA-1. The attribution tables are numbered to coincide with the Part number of the Division B provision. e.g. the attribution for Division B Sentence 9.5.10.1.(1) "Width of Hallway Within Dwelling Unit" in Table 9 of SA-1 is [F10 – OS3.7]

The attribution tables reference every provision in each Part of Division B. In the attribution tables, beside each Code reference are the linked *objectives* and *functional statements* attributed to that Division B provision.

Compliance with Division B (*acceptable solutions*)

Compliance with Division B (*acceptable solutions*) of the 2006 Code can be achieved in two ways:

a) by complying with the applicable *acceptable solutions* in Division B [Div. A, Clause 1.2.1.1.(1)(a)]

or

b) by using an *alternative solution* that will achieve the level of performance required the applicable *acceptable solution* (in Division B) in respect of the *objectives* and *functional statements* attributed to the applicable *acceptable solution* in Supplementary Standard SA-1 [Div. A, Clause 1.2.1.1.(1)(b)]

Division A	Division A *Compliance, Objectives and Functional statements* has three Parts. Part 1 describes how to achieve compliance with the Code. It also contains provisions dealing with the application of Division B Parts to buildings; and, the list of defined terms, that of applicable law and symbols and abbreviations. Part 2 contains the master list of Code *objectives*. Part 3 contains the master list of *functional statements* for the Code.
Division B	Division B, *Acceptable solutions* contains the technical provisions in 12 Parts.
Division C	Division C *Administrative Provisions* has four Parts. Part 1 contains information relating to professional design requirements, permits, inspections and fees. Part 2 relates to the Building Code Commission, the Building Materials Evaluation Commission, Minister's Rulings and Interpretations and documentation of *alternative solutions*. Part 3 contains administrative provisions relating to qualifications of building code practitioners and Part 4 has the rules of transition, revocation and commencement of the 2006 Building Code.
Functional statement	*means a function set out in Division A, Table 3.2.1.1. that a building or an element of a building is intended to perform.* *Functional statements* describe the functions that a building must perform to fulfill the *objectives*. *Functional statements* are the functions the building or its elements must be capable of performing.
Level of performance	Level of performance is *how well* (to what extent) a Division B provision or a proposed *alternative solution* performs in the "area of performance" derived from the linked pairs of *objectives* and *functional statements* attributed to the applicable *acceptable solution* in Supplementary Standard SA-1. Both prescriptive and performance provisions of the Building Code have a level of performance.
Objective	*mean an objective set out in Division A, Article 2.2.1.1.* *Objectives* state what the Code aims to achieve. In an *objective*-based code, every *acceptable solution* in Division B is

	linked to at least one of the Code's *objectives* (goals).
Top-level *Objective*	A top-level *objective* is one of the seven categories of *objectives* in the 2006 Building Code. They are OS Safety, OH Health, OA Accessibility, OP Fire, Structural, Water and Sewage Protection of Buildings, OR Resource Conservation, OE, Environmental Integrity and OC Conservation of Buildings.
Second-level *Objective*	A second-level *objective* defines the *aspect* of Safety, Health, Accessibility, etc … that is being addressed. e.g. OS1 Safety – Fire safety.
Third-level *Objective*	A third-level *objective* describes the specific *cause* of the injury, illness, impeded access or damage that is to be avoided. e.g. OS1.1, … caused by fire or explosion.
***Objective*-Based Code**	An *objective*-based code is a code in which every technical requirement achieves one or more of the seven categories of *objectives*. An *objective*-based code contains prescriptive and performance provisions.
Performance Code	A performance code, or performance-based code, is a code that contains only performance provisions.
Performance Provision	A performance provision states the required performance of a building feature without describing how to achieve compliance. Compliance can usually be confirmed by tests, calculations or engineering analysis.
Prescriptive Provision	A prescriptive provision specifies what is required. It describes how to meet a requirement. Compliance with a prescriptive provision can usually be confirmed by visual inspection or simple measurement.

Appendix 2

Answer Guides

Ex.	Q	**Answers Module 2**
2-1		(Guided)
2-2	1	Div. B, Subsection 3.2.2.
	2	Div. B, Article 6.2.2.6.
	3	Div. B, Table 1.3.1.2. Table is also referenced in Div. A, 1.5
	4	Div. A, Article 1.4.1.2. contains the list.
	5	Division B, Parts 3 and 9
2-3		(Guided)
2-4	1	Div. C, Article 1.1.1.1.
	2	Div. C, Article 1.4.1.1.
	3	Div. C, Section 3.1
2-5		(Guided)
2-6	1	Div. A, Part 3
	2	F04 To retard failure or collapse due to the effects of fire
	3	Div A, Part 2
	4	Health
	5	Div. A, Section 1.5 references Div. B, Subsection 1.3.1. [1.5.1.3.(1)]
	6	Div. A, Article 1.1.2.4.
	7	Div. A, Article 1.3.1.2.
2-7	1	Div. A, A-1.2.1.1.(1)(a)
	2	Division C, A-2.3.1.
	3	3. Div. B, A-9.9.8.4.(1)
	4	Division B, D-2.3.12.
Ex.	**Q**	**Answers Module 3**
3-1		Answers from students' experience, might include: -determine what code applies from legislation and general application statement - verify occupancy and size of building to determine applicable Parts - verify if compliance is intended with Parts 3 to 9 or if an equivalency is proposed
3-2	1	Section 8.-(1) of the Building Code Act states that Code is applicable to all construction
	2	Acceptable solutions/applying Division B under Div. A, Clause 1.2.1.1.(1)(a)
	3	Parts 1, 7, 12 based on Div. A, Article 1.1.2.1. and Part 9 based on Div. A, 1.1.2.4., Part 8 1.1.2.3., Parts 10&11 1.1.2.5.&1.1.2.6., Existing Buildings 1.1.2.7.
	4	Div. B, Article 9.23.4.2.
3-3	1	Div. A, 1.2.1.1.(1)(a) (using acceptable solutions)
	2	Parts 1, 7, 12 based on Div. A, Article 1.1.2.1. and Parts 3, 4, 5, and 6 based on Div. A, 1.1.2.2., Part 8 on 1.1.2.3.
	3	Div. B, 3.8.1.1. the requirements of Section 3.8. apply to all buildings (with certain exceptions that do not apply)
	4	Article 3.8.2.3.(1)

Ex.	Q	**Answers Module 5**
5-1		Answers from participants' experience, could include: - using a CCMC product evaluation as a basis - window sprinklers without BMEC Authorization Under Clause 28.-(4)(b) or a Ruling by the Minister under Clause 29.-(1)(a) or (c) of the *Building Code Act* - timed egress study in lieu of max. prescribed travel distances - products to standards (referenced documents) other than those found in Table 2.6.3.2.
5-2		(Guided)
5-3		(Guided)
5-4	1	Div. A, Clause 1.2.1.1.(1)(b) → Supplementary Standard SA-1, Table 6
	2	From SA-1, Table 3 for Div. B, Sentence 3.3.4.4.(6) [F05, F10-OS3.7]
	3	From SA-1, Table 3 for Div. B, Sentence 3.7.4.14.(1) [F20-OS3.1]
	4	From SA-1, Table 5 for Div. B, Sentence 5.2.1.1.(2) [F20-OS2.1] [F20,F40-OH1.1] [F20-OH1.2,OH1.3]
5-5		(Guided)

Module 6 - Case Studies

6-1 New Type of Smoke Alarm

Tasks: Inspector's assessment of the situation and action. Identification of applicable Division B provisions and any related provisions that could be considered. Optional steps to clarify the situation. Identify options of owner in achieving compliance if the smoke alarms do not comply with Division B.

1. If you were the Inspector, what action would you take?

- An Inspector might examine one of the installed smoke alarms to find the ULC label associated with CAN/ULC-S531, "Standard for Smoke Alarms".

- If the label is missing, the Inspector might ask or submit a written request under the authority of Clause 18.-(1)(a) of the *Building Code Act*, for documentation on the listing and installation of the smoke alarms.

- If the label is missing, the Inspector may make an Order to Comply directing the person to whom the permit was issued to file a notice of change to smoke alarms and obtain the authorization of the CBO for the change prior to occupancy. See Subsections 8.(12) to (14) and Clause 11.-(4)(b) of the *Building Code Act*.

2. Step 4a, what Div. B Code provisions are applicable? Are there related provisions that must be considered?

- Division B, Sentences 3.2.4.21.(1) [manufacturing], (7) [installation] and 1.3.1.2.(1) and Table 1.3.1.2., [listing].
- For a Part 3 building, smoke alarms are required to be designed according to CAN/ULC-S531 and installed to conform to CAN/ULC-S553.
- The other Sentences of Article 3.2.4.21 would also be considered.

3. Optional Step 5a, identify the pairs of objectives and functional statements linked to the applicable acceptable solutions of Division B.

- 3.2.4.21.(1) : [F11-OS1.5] [F81-OS1.5]
- 3.2.4.21.(7) : [F11-OS1.5] [F81-OS1.5]

4. Optional Step 5a, state the "areas of performance" in words using the format "The solution must <functional statement> so that <objective> reasons.

- [F11-OS1.5] The solution must notify persons in a timely manner of the need to take action in an emergency so that a person in a building will not be delayed in or impeded from moving to a safe place during a fire emergency.
- [F81-OS1.5] The solution must minimize the risk of malfunction, interference, damage, tampering, lack of use or misuse so that a person in a building will not be delayed in or impeded from moving to a safe place during a fire emergency.

5. What options are available to the owner if the smoke alarms do not comply with Division B, Sentences 3.2.4.21.(1) and (7)?

- The owner could install additional smoke alarms that meet CAN/ULC-S531 and S553 standards.
- The owner could have the designer submit an *alternative solution* under Div. A, Clause 1.2.1.1.(1)(b). The designer would need to submit documentation showing that the proposed smoke alarms have a level of performance that is equivalent to CAN/ULC-S531 and S553 standards.
- Are there other options?

6-2 Carport Roof Joists

Task: Carry out the plans review of the roof joists.

Steps 1 and 2 of the process (Receive application and verify compliance with Div C) have already been done.

1. Step 3, Confirm the Intended Method of Compliance. The applicant neither identified an unusual framing system nor provided documentation, under Div. C, Section 2.1., supporting an alternative solution. Therefore, the method of compliance is using *acceptable solutions* under Div A, Clause 1.2.1.1.(1)(a).

2. Step 4a, identify the applicable Division B provisions and confirm compliance. Are there any other provisions?

- Div. B, Sentence 9.23.4.2.(1) "Spans for Joists" which directs you to Tables A-1 to A-7 in general and Table A-4 in particular.
- Table A-4, "Maximum Spans for Roof Joists" is applicable since it matches the commercial designation of wood (SPF), the grade of wood (No. 1), the size of roof joists (38 mm x 184 mm), the spacing of roof joists (400 mm o.c.) and the specified snow load (2.0 kPa).
- As per Table A-4, SPF, No.1 Grade, 38 x 184 mm roof joists at 400 mm o.c. have a maximum allowable span of 3.68 m. The proposed 4.0 m span does not comply.
- Division B, Section 9.4. "Structural Requirements" and Subsection 9.23.1. "Application of Wood Frame Construction".

3. Optional Step 5a, in this case, is there a need to consult the *objectives* and *functional statements* and state the "area of performance" in words? No, since the maximum allowable span of the proposed roof joists is simply exceeded.

4. If the proposed design does not comply with the provisions of Division B, identify the contraventions so that the CBO may officially inform the applicant of the reasons for the refusal of the permit. [BCA Ss. 8.-(2.3) and OBC Div. C, Clause 1.3.1.3.(1)(b)]

According to Div. B, Sentence 9.23.4.2.(1) and Table A-4, the span of the proposed roof joists exceeds the maximum span permitted.

5. Considering the "unofficial process" and before proceeding to the Final Step, acceptance or refusal and document retention, is there an easy solution, other than an *alternative solution*, that could fix this problem?

- The applicant could decide to comply with Table A-4 by:
    - decreasing the spacing of the roof joists to 300 mm o.c. (maximum span allowed is 4.05 m), **or**
    - increasing the size of the roof joists to 38 mm x 235 mm (maximum span allowed is 4.70 m)

6-3 Access to a Crawl Space

Task: Follow the "a" path of the proposed flow chart for applying the 2006 Code, consider the homeowner's proposal and familiarize yourself with the provisions for crawl spaces under Division B of the Code.

1. Step 3, confirm the intended method of compliance.

- Because the applicant has not provided any documentation under Division C, Section 2.1., according to Div. A, Clause 1.2.1.1.(1)(a), the intended method of compliance is with the *acceptable solutions* (provisions) of Division B.

2. Step 4a, what Division B provisions (acceptable solutions) are applicable? Is there compliance? Are there related provisions that must be considered?

- The requirement to provide an access opening to an enclosed crawl space is Division B, Sentence 9.18.2.1.(1). An access opening of not less than 500 mm by 700 mm (19¾ in by 2 ft 4 in) must be provided to each crawl space that serves a single dwelling unit.
- There is no compliance because the applicant intends to omit the access opening.
- *The provisions of Section 9.18. apply to crawl spaces.*

3. Optional Step 5a, identify the pairs of objectives and functional statements linked (attributed) to the applicable provisions.

- 9.18.2.1.(1): [F82-OH1.1] [F82-OH1.2]

4. Optional Step 5a, state the "area of performance" in words.

- [F82-OH1.1] The solution must minimize the risk of inadequate performance due to improper maintenance or lack of maintenance for health reasons (indoor air quality).

- [F82-OH1.2] The solution must minimize the risk of inadequate performance due to improper maintenance or lack of maintenance for health reasons (inadequate thermal comfort).

5. Now that you have studied the situation, how can the design of the crawl space access opening be made to comply with Division A, Article 1.2.1.1.?

To meet Division A, Clause 1.2.1.1.(1)(a) the homeowner can:
- provide an access opening with a lock on the access door, **or**
- choose to leave the crawl space unenclosed, **or**
- omit to provide a door or hatch on the access opening provided the crawl space is heated and the access opening into the crawl space is from adjacent heated space in accordance with Sentence 9.18.2.1.(2) and all related provisions for heated crawl spaces
- Are there other options?

To meet Division A, Clause 1.2.1.1.(1)(b) the homeowner can apply to use an *alternative solution.*

6-4 Rated Floor Assembly Part 3 Building

Tasks: You are the Plans Examiner, familiarize yourself with the proposal of the Architect by following the "b" path of the proposed flow chart for applying the 2006 Code. Identify the method of compliance that the Architect has selected to comply with Division B.

1. Step 3, confirm the method of compliance that has been selected by the Architect to comply with Division B.
- The Architect is proposing to use an *alternative solution* to comply with Division B.

2. Step 4b, what Division B Code provisions (acceptable solutions) are applicable for the determination of a fire-resistance rating in a Part 3 building?

- Division B, Sentences 3.1.7.1.(1) and (2)
- The fire-resistance rating of a material, assembly of materials or structural member must be determined on the basis of tests CAN/ULC-S101 or from Supplementary Standards SB-2.

- Note that the construction requirements, relative to building size and occupancy, from the Articles of Subsection of 3.2.2. are not applicable provisions because the designer is proposing to meet those provisions. The Architect is not proposing a different fire-resistance rating, just a different basis to establish the required fire-resistance rating.

3. Step 5b, For purposes of this exercise, skip Step 5b, check databases or previously approved alternative solutions.

4. Step 6b, confirm applicable pairs of objectives and functional statements attributed (linked to) the applicable Division B provisions?

- 3.1.7.1.(1): [F03-OP1.2] [F04-OP1.3] [F03-OS1.2] [F04-OS1.3]
- 3.1.7.1.(2) → 3.1.7.1.(1)

5. Optional at Step 6b, state the "areas of performance" in words using the format "The solution must <functional statement> for <objective> reasons.

- [F03-OP1.2] The solution must retard the effects of fire on areas beyond its point of origin for fire protection of the building reasons.

- [F04-OP1.3] The solution must retard failure or collapse due to the effects of fire for fire protection of the building reasons.

- [F03-OS1.2] The solution must retard the effects of fire on areas beyond its point of origin for structural safety reasons.

- [F04-OS1.3] The solution must retard failure or collapse due to the effects of fire for structural safety reasons.

CONCLUSION

For the *alternative solution* to be accepted, the documentation must convince the person having jurisdiction that the *alternative solution* will achieve the level of performance required by the applicable Division B provisions (*acceptable solution*). Level of performance will be dealt with in Module 11.

6-5 Exposure of Exit Facilities

1. Step 3, confirm the intended method of compliance.

- Because the applicant has not provided any documentation under Division C, Section 2.1., according to Div. A, Clause 1.2.1.1.(1)(a), the intended method of compliance is with the *acceptable solutions* (provisions) of Division B.

2. Step 4a, what Division B provisions (acceptable solutions) are applicable? Is there compliance? Are there related provisions that must be considered?

- The applicable Division B provisions are the ones that deal with the protection of an unenclosed exterior exit stair:
    - Div. B, Sentence 3.2.3.13.(2) requires that when an opening in the exterior wall of a building is within 3 metres horizontally from an unenclosed exterior exit stair and less than 10 m below the said exit stair or less than 5 m above the said exit stair, that such opening be protected in accordance with Sentence(4).
    - Div. B, Sentence 3.2.3.13.(4) requires that such opening be protected with glass block, wired glass or a closure.

Confirm whether the design complies.

The proposed design does not comply because there are two unprotected openings within 3 metres horizontally and 5 metres above or 10 metres below the unenclosed exterior exit stair.

Are there related provisions that must be considered?

- Glass block must conform to the requirements of Div. B, Article 3.1.8.4.
- Wired glass assembly must conform to SB-2
- A closure must conform to Div. B, Subsection 3.1.8. and Articles 3.2.3.1. and 3.2.3.14.

3. Optional Step 5a, identify the pairs of objectives and functional statements linked (attributed) to the applicable provisions.

- 3.2.3.13.(2) refers you to Sentence (4)
- 3.2.3.13.(4) [F06-OP1.2] [F05-OS1.2] [F0[illegible]-OS1.2]

4. Optional Step 5a, state the "area of performance" in words using the format "The solution must <functional statement> for <objective> reasons.

- [F06-OP1.2] The solution must retard the effects of fire on facilities for suppression and emergency response, for reasons of fire impacting on the building beyond its point of origin.
- [F05-OS1.2] The solution must retard the effects of fire on emergency egress facilities, for reasons of fire impacting on persons beyond its point of origin.
- [F06-OS1.2] The solution must retard the effects of fire on facilities for suppression and emergency response, for reasons of fire impacting on persons beyond its point of origin.

5. From the following, identify the design options that could comply with Division B, *acceptable solutions* and those that would require assessment under the "b" path as an *alternative solution*.

A. Remove the window openings and reconstruct the exterior wall assembly.
   - Could comply with Division B *acceptable solutions* because there would no longer be an unprotected opening exposing the unenclosed exterior exit stair.

B. Install wired glass or glass block in the window openings.
   - Could comply with Div. B, Clause 3.2.3.13.(4)(a) or (b) as an *acceptable solution*.

C. Install sprinklers in the entire building.
   - This does not comply with Div. B Sentence 3.2.3.13.(4) since protection of the openings is not proposed and the requirements of Sentence 3.2.3.13.(4) apply to both sprinklered and unsprinklered buildings. Could comply with Division B Clause 3.2.3.13.(4)(a), (b) or (c) as an *alternative solution* if it was demonstrated that the level of performance required by Div. B, Clause 3.2.3.13.(4)(a), (b) or (c) was achieved.

D. Install window sprinkler systems in the window openings.
   - Could comply with Division B *acceptable solutions* as a window sprinkler system conforming to an Authorization of the Building Materials Evaluation Commission, a Minister's Ruling or Div. B, Article 3.1.8.18. "Sprinkler Protected Glazed Wall Assembly".

E. Install fire shutters, in accordance NFPA 80, in the window openings.
   - Could comply with Div. B, Clause 3.2.3.13.(4)(c) as an *acceptable solution* since a fire shutter is a rated closure.

Ex.	**Q**	**Module 7 Answers**
7-1		Answers from participants' experience could include: • product specification packages and approvals • site plan and survey • documentation on unusual features • letters of undertakingengineering analysis of a design • results of computer modeling
7-2	1A	Required
	1B	Required
	1C	Required
	1D	Not Required (Letter from all current tenants in support of the design)
	1E	Required
	1F	Required
	1G	Required
	1H	Not Required (Detailed description of the reasons why the alternative solution is being sought instead of using an acceptable solution)
	2	Missing documentation: • qualifications of the applicant • evaluation of the level of performance of the applicable Division B provisions
7-3	1	(Guided)
Ex	**Q**	**Answers Module 8**
8-1	1	OS1 Safety - Fire Safety has 5 third level objectives
	2	OS2 Safety - Structural Safety has 6 third level objectives
	3	OS3 Safety - Safety in Use has 7 third level objectives
	4	OS4 Safety - Resistance to Unwanted Entry has 2 third level objectives
8-2		(Guided)
8-3		(Guided)
8-4	1	F30 To minimize the risk of injury to persons as a result of tripping, slipping, falling, contact, drowning or collision.
	2	F52 To maintain appropriate relative humidity.
	3	F11 To notify persons, in a timely manner, of the need to take action in an emergency.
	4	F04 To retard failure or collapse due to the effects of fire.

8-5	1	For Div. B, Sentence 9.8.4.1.(1), [F30-OS3.1] [F10-OS3.7]
	2a	For the provisions of Div. B, Subsections 9.8.2. to 9.8.6. [F30-OS3.1] [F10-OS3.7] are linked to most provisions.
	2b	They fulfill the same functions and meet the same objectives (same "areas of performance").
	3	No, [F03 and OS1.2] fire impacting areas beyond its point of origin, are not linked to Div. B, Sentence 9.20.6.1.(1).
	4	The pairs of *functional statements* and *objectives* linked to the applicable Sentences under Subsection 3.1.17.
8-6		(Guided)
8-7		[F20-OS2.1] [F20-OP2.1]
8-8		[F10-OS3.7] [F73-OA1] [F74-OA2]
8-9		[F70-OH2.1] [F71-OH2.1] [F72-OH2.1] [F70-OH2.3] [F71-OH2.3] [F72-OH2.3]

Applicable Provisions	**FS**	**OBJ**	**Functional Statement**		**LINK**	**Objective**	
			To <function>	**What/from**		**People/ building**	**Not <harmed> due to OR can <action>**
Ex. 8-7 Div. B 4.1.5.13.(1)	F20	OS 2.1	To support and withstand expected loads and forces		*so that*	people are not hurt by loads exceeding loadbearing capacity of the building elements	
	F20	OP 2.1	To support and withstand expected loads and forces		*so that*	the building is not damaged by loads exceeding loadbearing capacity of the building elements	
Ex. 8-8 Div. B 3.8.1.5.(1)	F10	OS 3.7	To facilitate timely evacuation to a safe place in an emergency		*so that*	people will not be exposed to risk of injury caused by delayed evacuation	
	F73	OA 1	To facilitate access of building and its facilities by persons with physical or sensory disabilities		*so that*	those people will not be impeded from using the building and its facilities	
	F74	OA 2	To facilitate use of building's facilities by persons with physical or sensory disabilities		*so that*	those people will not be impeded from using the building's facilities	
Ex. 8-9 Div. B 9.31.4.1.(1)	F70	OH 2.1	To provide potable water		*so that*	people will not get sick from exposure to human or domestic waste	
	F71	OH 2.1	To provide facilities for personal hygiene		*so that*	people will not get sick from exposure to human or domestic waste	
	F72	OH 2.1	To provide facilities for sanitary disposal of human and domestic wastes		*so that*	people will not be exposed to unsanitary conditions caused by inadequate facilities for personal hygiene	
	F70	OH 2.3	To provide potable water		*so that*	people will be exposed to unsanitary conditions caused by inadequate facilities for personal hygiene	
	F71	OH 2.3	To provide facilities for personal hygiene		*so that*	people will not be exposed to unsanitary conditions caused by inadequate facilities for personal hygiene	
	F72	OH 2.3	To provide facilities for sanitary disposal of human and domestic wastes		*so that*	people will not be exposed to unsanitary conditions caused by inadequate facilities for personal hygiene	

Ex.	**Q**	**Module 9 Answers**
9-1		(Guided)
9-2	1	Prescriptive – can be confirmed with a visual check.
	2	Performance – does not state how to install the roofing to achieve compliance. It states the expected performance; that is, the roof must shed rain effectively and prevent water ingress from ice damming.
	3	Prescriptive – can be confirmed with a simple measurement.
	4	Performance – requires engineering analysis or testing with equipment to confirm compliance.
	5	Performance – requires testing with equipment such as a light meter or engineering calculations to confirm compliance.
	6	Performance – requires engineering analysis or load testing to confirm compliance.
	7	Prescriptive – compliance can be confirmed by visual inspection and a yes or no answer. A loadbearing material is easy to identify as either a noncombustible or a combustible loadbearing material.
9-3	1	Average level of not less than 10 lx (0.9 ft-candles) at floor or tread level.
	2	Designed for concentrated load of 0.5 kN (113 lb) over defined area at any point in the element or elements.
	3	Shed rain effectively and prevent water due to ice damming from entering the roof.
	4	Permeance not greater than 60 ng/(Pa.s.m^2).
9-4		(Guided)
9-5		(Guided)
9-6		(Guided)
Ex. #	**Q**	**Module 10 Answers**
10-1		(Guided)
10-2	1	Commissioning of the smoke control system, maintenance procedures, fuel load for spaces served by the system, periodic testing.
	2	Restriction on type of storage, maximum fuel load, documentation in Fire Safety Plan, reduced travel distance and occupant load.
	3	Documentation in Fire Safety Plan, notices to supervisory staff.
	4	Commissioning for the locking devices, documentation in Fire Safety Plan, special signage, special training requirements for supervisory staff.

Module 11, Case Study 11-1 (Guided)		
Case Study 11-2		
Step 2		**Step 2 - Confirm Compliance with Other Division C Provisions**
	1	Use the Sample Checklist for Submission Information or a variation thereof to confirm that the documentation complies with Division C provisions.
	2	The basic review indicates that the application complies with the other Division C provisions.
	3	Résumé with detailed qualifications of Life Safety Consultant has not been provided.
Step 3		**Step 3, confirm the design, or portion thereof that complies with Division B using**:
	1	*Alternative solution* under Div. A, Clause 1.2.1.1.(1)(b) for the width of the public corridor, and
	2	*Acceptable solutions* under Div. A, Clause 1.2.1.1.(1)(a) for the remainder of the renovation project.
Step 4b		**Step 4b, Confirm Applicable Division B Provisions**
	1	Public corridors are required to have a minimum width of 1 100 mm, Sentence 9.9.3.3.(1).
	2	The ground floor has a barrier-free entrance, therefore its public corridor must have the configuration of a barrier-free path of travel as provided by Sentences 9.5.2.1.(1) → 3.8.1.3.(1) and (4). Calls for a minimum width of 1 100 mm with an unobstructed space of not less than 1 600 mm X 1 600 mm at a maximum interval of 30 m where persons in a wheel chair can meet or turn around.
Step 5b		**Check Database of *Alternative Solutions*. (optional)**
Step 6b		**Confirm Applicable Objectives and Functional Statements**
		Div. B, Sentence 9.9.3.3.(1), [F30-OS3.1] [F10-OS3.7] Div. B, Sentences 3.8.1.3.(1) and (4), [F73-OA1] by way of Sentence 9.5.2.1.(1)

From the linked pairs of *objectives* and *functional statements*, state the "areas of performance" in words.

Applicable Provisions	FS	OBJ	Functional Statement		LINK	Objective	
			To <function>	What/from		People/ building	Not <harmed> due to OR can <action>
9.9.3.3.(1)	F 30	OS 3.1	To minimize the risk of injury to persons as a result of contact or collision		*so that*	a person in the use of a building will not be exposed to an unacceptable risk of injury due to hazards caused by contact or collision	
	F 10	OS 3.7	To facilitate the timely movement of persons to a safe place in an emergency		*so that*	a person in the use of a building will not be exposed to an unacceptable risk of injury due to hazards caused by persons being delayed or impeded from moving to a safe place during an emergency	
3.8.1.3.(1) and (4)	F 73	OA 1	To facilitate circulation in the building by persons with physical or sensory disabilities		*so that*	a person with a physical or sensory disability will not be unacceptably impeded from circulating within the building	

Step 7b		**Confirm the Level of Performance of the Applicable Division B Provisions**
	1	Check the "areas of performance" that were summarized at Step 6b above.
	2	A width of 1100 mm for a public corridor reduces the risk of: • delayed evacuation by providing enough space for people to move to the exit • collision by providing enough space for two people to pass each other • wheelchair user requiring assistance by providing 1600 mm x 1600 mm spaces not more than 30 m apart as unobstructed spaces to manoeuvre and turn around independently
	3	• An exit stair is permitted to be only 900 mm wide under Div. B, Sentence 9.9.3.2.(1) [capacity of 97/112 persons in a Part 3 Building, see Div. B, Clauses 3.4.3.4.(1)(a) and (c)] • 100 mm handrail projections are permitted into the required width of means of egress under Sentences 3.8.3.2.(1), 9.8.7.6.(1) and 9.9.5.3.(1) (However, the degree to which this will reduce the level of performance is debatable because arms and shoulders can extend into this space and some wheel chairs could fit under.) C.A. C106b in a Div. B, Part 11 renovation of a Part 9 building can be 900 mm wide without CBO's approval
	4	Wall roughness may affect how close to the walls of a public corridor occupants will travel (this principle is not stated in the provision for public corridor width)
	5	• If width increased - lower probability of a collision, possibly faster evacuation, and less chance that a person in a wheelchair would need assistance. • If width decreased - higher probability of a collision, possibly slower evacuation, and greater chance that a person in a wheelchair would need assistance.
	6	The level of performance in this situation that would comply with Division B would be a 900 mm wide public corridor with a 100 mm handrail projection on each side of public corridor with rough wall surfaces.
	7	The level of performance of the Division B provisions is: A public corridor width that facilitates safe and timely evacuation, reduces the risk of collisions, and permits a person in a wheelchair to circulate without requiring assistance.
	8	To assign a quantitative (numerical value) level of performance, a timed egress study could be submitted, or research on pedestrian movement and barrier-free clearances could be done.

Step 8b		**Confirm the Level of Performance of the Proposed Alternative Solutions**
	1	The Code Analysis might include an assessment of: • evacuation through the 890 mm wide public corridor • collision potential • the probability of a person in a wheelchair requiring assistance.
	2	Level of Performance for evacuation: 890 mm wide public corridor will not impede evacuation due to low occupant load of 4 dwelling units per storey. Level of performance for collision: 890 mm wide public corridor will permit person to pass, low occupant load will limit probability that occupants will meet in the public corridor. Level of performance for barrier-free circulation on the first storey: 890 mm wide public corridor is narrower than the minimum 1100 mm required by Div. B, Sentence 3.8.1.3.(1), and 1500 mm wide unobstructed space in a public corridor is nominally less than 1600 mm required by Div. B, Sentence 3.8.1.3.(4).
Step 9b		**Compare Levels of Performance**
	1	The Division B level of performance for evacuation and pedestrian movement may be considered to be met by a 890 mm wide public corridor due to the limited occupant load on each floor area. Other answers are possible depending on the person conducting the evaluation since it is a matter of judgment.
	2	The Division B level of performance for barrier-free circulation may be considered to be met by the proposal due to the public corridor width difference of 210 mm and 100 mm difference for width of unobstructed space. (judgement call based on Code Analysis provided)
Step 10b		**Establish Conditions of Acceptance, if any**
	1	Conditions might include documentation in Fire Safety Plan to alert emergency responders, a condition for a smooth wall finish on corridor walls without obstructions that would further reduce the width There may be several other possible conditions.
Final Step		**Acceptance or Refusal and Documentation Retention**
	1	All submitted information including the submission form, the submitted documents, any correspondence, a record of the evaluation, the decision and conditions should be retained.
	2	Fire Department, Paramedics
	3	Fire Safety Plan

Note: The assessment of Case Study 12-1 and 12-2 represents a suggested procedure to emphasize the process rather than its technical completeness. There are technical issues that would need to be investigated that are beyond the scope of this course. Other acceptable solutions or proposed alternative solutions may exist for each situation.

CASE STUDY 12-1 Open Stair Between Storeys in Heritage Building

Step 1 – Receive Application Conforming to Division C, Clauses 1.3.1.3.(5)(a) to (e)

Step 2 – Confirm Compliance with the other Division C Provisions This task is facilitated by the use of the following checklist or a variation thereof.

Required for Submission of a Proposed Alternative Solution			Submitted (yes/no)
1		A description of the proposed alternative solution [Div. A, Clause 1.2.1.1.(1)(b)]	yes
2		Proponent(s) name, company, address, contact information	Yes
3		Designer's qualification appear on Schedule 1 When proponent is an Architect, indicate BCDS qualifications under the *Architect's Act*	Yes
4		Code Analysis [documentation under Div. C, Article 2.1.1.1.] Establish on the basis of past performance, tests described in Div. C, Article 2.1.1.2., or other evaluation that the proposed *alternative solution* will achieve the level of performance required under Div. B, by way of Div. A, Article 1.2.1.1.	Yes
	A	Identification of applicable Division B provisions (*acceptable solutions*)	Yes
	B	Identification of applicable linked pairs of *objectives* and *functional statements*	Yes
	C	An evaluation of the level of performance of applicable Division B provisions	Yes
	D	An evaluation of the level of performance of the proposed *alternative solution*	Yes
	E	Identification of any assumptions, limiting or restricting factors	Yes
	F	Identification of testing procedures, engineering studies, building performance parameters etc… to support the assessment for compliance	Yes
5		Information concerning any special maintenance or operation requirements, including commissioning, necessary for the integrity of the *alternative solution* after construction is complete	Yes
Optional			
6		A list of submitted documents: These could include a concept report, calculations, fire modelling, test reports, precedents, fire scenario evaluation, alternate Codes and standards, drawings, etc	Yes
7		Reason for the proposed *alternative solution*	N/A
8		A list of applicable sections of referenced documents (standards)	No
9		Résumé of designer with details of qualifications	Yes
10		Other: (specify)	

Step 3 – Confirm Method of Compliance

Based on the submitted documentation, establish which part of the design conform to Division B using *acceptable solutions* under Division A, Clause 1.2.1.1.(1)(a) and which part of the design conform to Division B using *alternative solutions* under Division A, Clause 1.2.1.1.(1)(b).

Step 4b – Confirm Applicable Division B Provisions

Here you confirm the applicable Division B provisions that are going to be complied with using an *alternative solution*.

- Division B, Clause 3.2.2.25.(2) would require the floor assemblies of this building to be constructed as fire separations with a fire-resistance rating of 45 minutes.

- Division B, Sentence 3.4.4.1.(1) would require every exit of this building to be separated from the remainder of the building a fire separation with a fire-resistance rating of not less than 45 minutes.

Step 5b – Check Databases (optional) None to be checked.

Step 6b – Confirm Applicable Objectives and Functional Statements and state "areas of performance" in words

For Division B, Clause 3.2.2.25.(2)(a):

- There are many *objectives* and *functional statements* for Sentence (2), however, ***not all apply*** since the open stair affects only the continuity of the fire separation provided by the floor assembly and not the rating of the floor assembly. Only the *objectives* and *functional statements* attributed to the ***combustible floor assembly as a fire separation*** will be applicable since this is the provision of Division B that the *alternative solution* is proposing to deal with.

For Division B, Sentence 3.4.4.1.(1)

- All *objectives* and *functional statements* linked to this sentence are applicable.

Sentence	F.S.	Obj.	"Areas of Performance" in words	
3.2.2.25.(2)(a)	03	OP1.2	To slow fire spread beyond its point of origin so that	the building is not damaged by fire beyond its point of origin
	03	OS1.2		people are not injured by fire spread beyond its point of origin
	04	OP1.2	To retard failure or collapse due to fire so that	the building is not damaged by fire spread beyond its point of origin
	04	OP1.3		the building is not damaged by collapse of physical elements due to fire
	04	OS1.2		people are not injured by fire spread beyond its point of origin
	04	OS1.3		people are not injured by the collapse of physical elements due to fire
3.4.4.1.(1)	03	OP1.2	To slow fire spread beyond its point of origin so that	the building is not damaged by fire spread beyond its point of origin
	03	OS1.2		people are not injured by fire spread beyond its point of origin
	05	OS1.5	To slow effects of fire on emergency egress facilities so that	people are not delayed or impeded from moving to a safe place during a fire emergency
	06	OP1.2	To slow the effects of fire on facilities for suppression and emergency response so that	the building is not damaged by fire spread beyond its point of origin
	06	OS1.2		people are not injured by fire spread beyond its point of origin
	06	OS1.5		people are not delayed or impeded from moving to a safe place during a fire emergency

Step 7b – Confirm Level of Performance of Applicable Division B provisions

Step 8b – Confirm Level of Performance of Proposed Alternative Solution

<table>
<tr><th colspan="2">Confirmation of Level of Performance of:</th></tr>
<tr><th>Division B provisions</th><th>Proposed Alternative Solution</th></tr>
<tr><td>The level of performance of the rated fire separation of a floor assembly and that of the rated exit enclosure should be considered together.

In summary, how well do these fire separations perform?
Slow fire spread so that people aren't hurt and the building is not damaged beyond the fire compartment of the origin of the fire
Protect the exit facility so that people can evacuate and firefighters can respond.</td><td>The applicant would be required to submit the Code Analysis and supporting documentation to establish the level of performance of the proposed <i>alternative solution</i>.

How well does the proposed <i>alternative solution</i> perform?
Slow fire spread so that people aren't hurt and the building is not damaged beyond the fire compartment of the origin of the fire
Protect the exit facility so that people can evacuate and firefighters can respond.</td></tr>
<tr><td>Basic conclusions:
A floor fire separation controls smoke movement between storeys.
An exit stair fire separation protects occupants and helps firefighters, and slow fire spread between storeys.
These two fire separations delay the spread and effects of fire.</td><td>Basic conclusions:
The proposed sprinkler system will slow fire spread although smoke may still spread between storeys.
The sprinkler system will provide some protection to the open stair between storeys.
The enclosed rear exit will provide protection to occupants and firefighters.
For possible further investigation:
proposed occupant load of space
proposed fuel load of space
level of supervision
monitoring of fire alarm
Fire Department access to building
protect the open stair between storeys as an escalator opening
These factors may influence level of performance in the applicable areas of performance.</td></tr>
</table>

Step 9b – Compare Levels of Performance

In this simplified case study the comparison of level of performance cannot be undertaken.

You may wish to note what information you would like confirmed or analysed in the submitted Code Analysis. You may also reflect on how you would have evaluated this proposal before this course.

Step 10b – Establish Conditions of Acceptance, if any

Assume that it has been satisfactorily established that the level of performance of the *alternative solution* meets the level of performance of the Division B provisions. In this case, possible conditions of acceptance could include:

- a limitation on occupant load on the 2nd Floor.
- a restriction on the contents and types of operations of the museum.
- a commitment to a certain level of supervision.
- construction that would mirror the protection of openings for escalators
- documentation in the Fire Safety Plan
- installation of single stage fire alarm system

Final Step – Acceptance or Refusal and Document Retention

Circulation of the *alternative solution* should include the Fire Department.

Notes:

- The applicant for the *alternative solution* could also propose that the entire space be considered an interconnected floor space; however, the exiting would still require an *alternative solution* that would be acceptable o the person having jurisdiction.

CASE STUDY 12-2 New Subflooring Material for Houses

Step 1 – Receive Application Conforming to Division C, Clause 1.3.1.3.(5)(a) to (e)

Step 2 – Confirm Compliance with other Division C Provisions

Required for Submission of a Proposed Alternative Solution			Submitted (yes/no)
1		A description of the proposed *alternative solution* [Div. A, Clause 1.2.1.1.(1)(b)]	Yes
2		Proponent(s) name, company, address, contact information	Yes
3		Designer's qualification appear on Schedule 1 When proponent is an Architect, indicate DCDS qualifications under the *Architect's Act*	Yes
4		Code Analysis (documentation under Division C Article 2.1.1.1.) Establish on the basis of past performance, tests described in Div. C Article 2.1.1.2., or other evaluation that the proposed *alternative solution* will achieve the level of performance required under Div. B, by way of Div. A, Article 1.2.1.1	Yes
	A	Identification of applicable Division B provisions (*acceptable solutions*)	Yes
	B	Identification of applicable linked pairs of *objectives* and *functional statements*	Yes
	C	An evaluation of the level of performance of applicable Division B provisions	Yes
	D	An evaluation of the level of performance of the proposed *alternative solution*	Yes
	E	Identification of any assumptions, limiting or restricting factors	Yes
	F	Identification of testing procedures, engineering studies, building performance parameters etc… to support the assessment for compliance	Yes
5		Information concerning any special maintenance or operation requirements, including commissioning, necessary for the integrity of the *alternative solution* after construction is complete	Yes
Optional			
6		A list of submitted documents: These could include a concept report, calculations, fire modelling, test reports, precedents, fire scenario evaluation, alternate Codes and standards, drawings, etc …	Yes
7		Reason for the proposed *alternative solution*	N/A
8		A list of applicable sections of referenced documents (standards)	No
9		Résumé of designer with details of qualifications	
10		Other: (specify)	

Step 3 – Confirm Method of Compliance

Step 4b – Confirm Applicable Division B Provisions

There are number of design choices in Part 9 for wood-based panels for subfloors. One "set" of *objectives* and *functional statements* for an *acceptable solution* must be identified by the proponent for the evaluation of the level of performance.

The proponent could choose any design that would satisfy Division B for use as a benchmark comparison for level of performance. For example, one choice is plywood subflooring with supports at 400 mm o.c.

Sentence 9.23.14.5.(1) and associated Table 9.23.14.5.A. specify the minimum thickness and therefore strength of plywood subflooring. Thus an applicable Division B provision (one that will not be met by the proposed product) is Sentence 9.23.14.5.(1).

The applicant has decided to compare the *alternative solution* to standard CSA 0153, "Poplar Plywood". Thus Clause 9.23.14.2.(1)(c) is also an applicable provision.

Applicable Division B Provisions	
Sentence	Provision
9.23.14.5.(1)	… thickness of plywood for subfloors shall conform to …. Table 9.25.14.5.A.
9.23.14.2.(1)(c)	CSA O153, "Poplar Plywood"

Are there related Division B provisions that musty be considered?

The level of performance of the proposed alternative solution would need to address all of the applicable provisions of Subsection 9.23.14., "Subflooring" such as edge support, direction of installation, type of finished flooring and fastening under Article 9.23.3.5. Does the subflooring material squeak when the floor framing members are subject to deflection and vibration? The documentation that was submitted with the "Application for an Alternative Solution" did not deal with these applicable provisions from Division B. Similarly, the applicable sections of referenced document CSA O153 have not been identified.

Step 5b – Check databases (optional) None to be checked

Step 6b – Confirm Applicable Objectives and Functional Statements and state the "areas of performance" in words

Note that the same objectives and functional statements are attributed to both 9.23.14.5.(1) and 9.23.14.2.1.(d)

Objectives / Functional Statements / "Areas of Performance"

Sentence	F.S.	Obj.	Summary of Areas of Performance		Applicable ?
9.23.14.5.(1)	F22	OH4	To limit movement under expected loads and forces so that	people will not be ill from high levels of vibration or deflection of building elements	yes
	F22	OP2.4		the building is not damaged by vibration and deflection of building elements	yes
	F22	OS3.1		people are not injured by tripping, slipping or falling	yes
	F20	OS2.1	To support loads and forces so that	people are not hurt by structural failure of the subfloor material	yes
9.23.14.2.1.(c)	F22	OH4	To limit movement under expected loads and forces so that	people will not be ill from high levels of vibration or deflection of building elements	yes
	F22	OP2.4		the building is not damaged by vibration and deflection of building elements	yes
	F22	OS3.1		people are not injured by tripping, slipping or falling	yes
	F20	OS2.1	To support loads and forces so that	people are not hurt by structural failure of the subfloor material	yes

Take note that the "areas of performance" cannot be completed because the applicant has not identified all of the applicable Division B provisions.

Step 7b – Confirm Level of Performance of Division B Provisions

Step 8b – Confirm Level of Performance of Proposed Alternative Solution

The evaluation of level of performance for this technical issue will require analyses and tests by an engineer and recognized testing agencies

The proponent is responsible for establishing the level of performance of the Division B provisions as well as that of the proposed *alternative solution*.

Supporting documentation for the proposed alternative solution might include but is not limited to:

- a structural analysis of both plywood subflooring (meeting Division B) and the proposed plastic subflooring
- a CCMC evaluation report of the proposed subflooring
- manufacturer's instructions for installation
- evidence of how the product has performed in other jurisdictions
- a comparison of how the plastic subflooring meets applicable provisions of materials standards for wood-based panels for subfloors
- an analysis of installation conditions and restrictions on use

Confirmation of Level of Performance of:	
Division B Provisions	**Proposed Alternative Solution**
Supporting documentation would quantify the structural performance of poplar subflooring subflooring in these "areas of performance": • To limit deflections so that people do not trip, slip or fall. • To limit deflections so that people are not made ill and the building is not damaged by excessive vibration and deflection. • To support loads so people are not hurt by structural failure of the subfloor. The structural performance would be quantified (described with numbers).	Supporting documentation would quantify the structural performance of the plastic subflooring in the "areas of performance". How well does the proposed alternative solution: • Limit deflections and vibration • Support loads The structural performance would be quantified (described with numbers). For possible further investigation: • All structural issues, edge support • Compatibility with flooring finishes • Fastening requirements • Performance of plastic subfloor material against provisions CSA O153 standard

Step 9b – Compare Levels of Performance

In this simplified case study the comparison of levels of performance cannot be undertaken.

You may wish to note what information you would like confirmed or analysed in the submitted Code Analysis. You may also reflect on how you would have evaluated this proposal before this course.

Step 10b – Establish Conditions of Acceptance if any

Assume that the application has been re-submitted and it has been satisfactorily established that the level of performance of the *alternative solution* meets the level of performance of the applicable Division B provisions. In this case, possible conditions to be established could include:

- a specified floor framing configuration

- a restriction on the applications of the subflooring – for example, cannot be used for radiant flooring systems, in rated fire separations, etc.
- a limitation on the types of floor finishes that can be applied above the product.

Final Step – Acceptance or Refusal and Document Retention

All submission documents and documents recording decisions during the evaluation process should be retained.

Appendix 3

Blank Worksheets

"AREAS OF PERFORMANCE" WORKSHEET

Applicable Provisions	FS	OBJ	Functional Statement		LINK	Objective	
			To <function>	What/from		People/ building	Not <harmed> due to OR can <action>
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		
					so that		

WORKSHEET FOR THE EVALUATION OF ALTERNATIVE SOLUTIONS

Project Location:

Project Information and Contacts

Owner/Designer/Agent:

Qualifications:

Summary of Proposal

Applicable Division B Provisions

Numeric reference	Summary of Provision

Objectives / Functional Statements / "Areas of Performance"

Sentence	F.S.	Obj.	Summary of "Areas of Performance"	N/A?

Confirmation of Level of Performance of:

Division B provisions What is the level of performance of Division B in the "areas of performance" defined by the applicable *objectives* and *functional statements*?	**Proposed Alternative Solution** • What is the level of performance of the proposed *alternative solution* that is established by the applicant? • Does the supporting documentation adequately support this level of performance?" • Do you agree with the established level of performance?

Evaluation:

Conditions of Approval, if any

Circulation of Accepted Alternative Solution

Proponent		Province		Other (specify)	
Chief Building Official		Central Registry			
Inspector		File			
Fire Department		Owner			

Accepted By:	BCIN:	Date:

Sample Checklist for Submission Information For Use by a Principal Authority/RCA

(based on Division C, Section 2.1)

Required for Submission of a Proposed Alternative Solution			**Submitted (yes/no)**
1	A description of the proposed *alternative solution* [Div. A, 1.2.1.1.(1)(b)]		
2	Proponent(s) name, company, address, contact information		
3	Designer's qualification appear on Schedule 1 When proponent is an Architect, indicate BCDS qualifications under the *Architect's Act*		
4	Code Analysis (documentation under Div. C, Article 2.1.1.1.) Establish on the basis of past performance, tests described in Div. C Article 2.1.1.2., or other evaluation that the proposed *alternative solution* will achieve the level of performance required under Div. B, by way of Div. A, Article 1.2.1.1		
	A	Identification of applicable Division B provisions (acceptable solutions)	
	B	Identification of applicable linked pairs of *objectives* and *functional statements*	
	C	An evaluation of the level of performance of applicable Division B provisions	
	D	An evaluation of the level of performance of the proposed *alternative solution*	
	E	Identification of any assumptions, limiting or restricting factors	
	F	Identification of testing procedures, engineering studies, building performance parameters etc… to support the assessment for compliance	
5	Information concerning any special maintenance or operation requirements, including commissioning, necessary for the integrity of the alternative solution after construction is complete		
Optional Items That Would be Helpful in the Review			
6	A list of submitted documents: These could include a concept report, calculations, fire modelling, test reports, precedents, fire scenario evaluation, alternate Codes and standards, drawings, etc…		
7	A reason for the proposed alternative solution.		
8	A list of applicable sections of referenced documents (standards)		
9	Résumé of designer with details of qualifications		
10	Other: (specify)		

Appendix 4

Intent Statements

Introduction

The listing of Intent statements is new information that will be published at a later date. This new information will be intended to help Code users understand the reasons for Code provisions. For each provision, intent statements will answer the question "Why is this in the Code?" This module will explore intent statements.

Learning Outcomes

At the end of this module, you will be able to:

- Describe the purpose of intent statements
- Recognize the possible wording and format of an intent statement.

Reasons For Code Provisions

The reason for a Code provision is often self-explanatory.

For example, the intent of a requirement for a wall to be constructed in a rated fire separation is that the wall will resist the spread of fire for a certain period of time. The minimum sizing of a beam is intended to reduce the risk of structural failure under specified loads. Sometimes, however, the intent of a provision is not clear, or is open to interpretation.

The reasons or intents for each Division B provision will be researched, discussed and reviewed by the Technical Committees responsible for reviewing changes to the Code.

The result will be the *2006 Building Code Intent Statements*, and these will only be available in electronic format due to the quantity of information it contains.

Intent statements will be similar in function to appendix notes in that they will* NOT *be part of the official Code.

It is expected that, in future Code editions, the rationale for each new or modified Division B provision will be recorded by the committees in an intent statement. There will be no intent statements for Division A or C provisions.

What will be An Intent Statement?

Intent statements will explain the reason(s) for each provision in Division B.

Intent statements will explain, in simplified terms, the basic thinking behind each Code provision in Division B. In other words, they will explain what might happen if the Code provision is not satisfied. Each will be unique to a specific provision.

Wording of Intent Statements

Intent statements will contain standard phrases that are repeated for every requirement. The most common phrases are likely to be "To limit the probability that/of…" and "…which could lead to…."

The language of intent statements will be based on risk reduction rather than risk elimination. This will reflect the philosophical basis of the Code, which is intended to *limit* the likelihood of hazards rather than totally remove the hazards since this is an impossible task. This is why the intent statements will not say "*…to eliminate the possibility of…*" or "*…to prevent….*"

The key phrases in an intent statement for a requirement will be:
"To limit the probability that/of…
…which could lead to…"

Format of Intent Statements

Div. B, Sentence 3.2.3.13.(4) will be used as an example to illustrate the format of an intent statement.

Div. B, Sentence 3.2.3.13.(4): *The opening protection referred to in Sentences (1), (2) and (3) shall consist of,*
(a) glass block conforming to the requirements of Article 3.1.8.14.,
(b) a wired glass assembly conforming to Supplementary Standards SB-2, or
(c) a closure conforming to the requirements of Subsection 3.1.8. and Articles 3.2.3.1. and 3.2.3.14.

One of the possible intent statements for Sentence 3.2.3.13.(4) may be:

Intent Statement: *To limit the probability of the spread of fire from exterior walls or openings of a building to exit facilities, which could lead to:*

A. *delays in evacuating or moving to a safe place, which could lead to harm to persons, and*
B. *delays in access to the building by emergency responders, which could lead to fire emergency response operations being delayed or ineffective, which could lead to the spread of fire, which could lead to harm to persons, including emergency responders.*

Note: There may be additional intent statements for this provision.

The intent statement for requirements will typically start with the standard phrase "*To limit the probability that/of*" followed by a description of an **initial consequence.** The initial consequence is what might happen if the provision is not met.

The **initial consequence** if openings near an unenclosed exit stair are not protected is:
To limit the probability of

→ **spread of fire from exterior walls or openings of a building to exit facilities**.

The initial consequence may be followed by the standard phrase "*which could lead to,*" followed by a **chain of consequences** resulting from the initial consequence. For example:

→ *To limit the probability of* spread of fire from exterior walls or openings of a building to exit facilities, *which could lead to*:

B.

- **delays in access to the building by emergency responders**, *which could lead to*
- **fire emergency response operations being delayed or ineffective**, *which could lead to*
- **spread of fire**, *which could lead to…*

The description of the chain of consequences will be completed by the **negative outcome** the Code attempts to prevent.

In this example, the final consequence at the end of the chain of consequences is "harm to persons.". This is the negative outcome.

Intent statement: *To limit the probability of* the spread of fire from exterior walls or openings of a building to exit facilities, *which could lead to*:
A. delays in evacuating or moving to a safe place, *which could lead to* **harm to persons**, and
B. delays in access to the building by emergency responders, *which could lead to* fire emergency response operations being delayed or ineffective, *which could lead to* the spread of fire, *which could lead to* **harm to persons**, including emergency responders.

For the 2006 Building Code, there will be only six possible negative outcomes:

- **harm to persons** (illness or injury),
- **impeded access** (inability of a person to have access to or to circulate in a building without the assistance of another person),
- **damage to buildings or adjacent buildings**
- **depletion and/or reduction of resources**
- **degradation of the environment, or**
- **reduction of the existing building stock.**

Objective	Negative Outcome in Intent Statement
OS Safety	Harm to persons (injury)
OH Health	Harm to persons (illness)
OA Accessibility	Impeded access
OP Fire, Structural, Water and Sewage Protection of Buildings	Fire or structural damage to the building or adjacent buildings. Harm to persons (injury)
OR Resource Conservation	Depletion or reduction of resources
OE Environmental Integrity	Degradation of the environment
OC Building Conservation	Reduction of the existing building stock

Each intent statement will describe a specific negative outcome. There may be more than one intent statement for a provision (I1, I2, etc.). The ultimate reason(s) for the Code requirement is to avoid all of these negative outcomes.

An intent statement will describe three types of reasons for a requirement:

1. **Initial consequence**
2. **Chain of consequences (if any)**
3. **Negative outcome**

NOTE: ***Intent statements will not be "written in stone." They will capture the intent of provisions as currently understood. Intent statements may be revised in the future as a result of further research, new technology and Code user feedback.***

Multiple Intent Statements

A provision may have more than one intent statement if:

- there is more than one initial consequence,
- there is more than one negative outcome, and/or
- it is linked to more than one objective.

Recall the Code's objectives – OS, OH, OA, OP, OR, OE and OC. If a provision has more than one objective, intent statements will be grouped with the related objective. These will be shown as separate windows in the electronic version of the Code.

It will be important to check all intent statements and all windows.

For example, Div. B, 3.6.3.3.(7) requires a linen chute discharge room to have a fire separation with at least a 1 hour fire resistance rating. This requirement is linked to two different objectives and therefore will have two windows:

3.6.3.3. (7) Linen and Refuse Chutes

OS1

F03-OS1.2

I1. To limit the probability tat a fire involving a room into which a linen chute discharges will spread to other parts of the building, which could lead to harm to persons.

OP1

F03-OP1.2

I1. To limit the probability that a fire involving a room into which a linen chute discharges will spread to other parts of the building, which could lead to damage to the building.

Intent Statements for 9.10.10.4.(1) Appliances and Equipment to be Located in a Service Room

OS1 Fire Safety

I1. To limit the probability that fire involving a fuel-fired appliance in a service room will spread from the service room to other parts of the building, which could lead to harm to persons.

I2. To limit the probability that a fire originating in a location outside a service room will spread into the service room, which could lead to the disruption and discontinuation of service from equipment located in the service room, which could lead to an undue fire hazard in the building, which could lead to harm to persons.

Phrases Other Than "To Limit the Probability of"

Some Division B provisions are not technical requirements. Instead they direct code users to another area of the Code, or they clarify a requirement, or they explain the application of a requirement. The intent statements for these types of provisions may include wording such as:

- "To direct Code users to…"
- "To clarify…"
- "To expand/limit the application of …"
- "To exempt…"
- "To modify…"
- etc.

For example, Div. B, Sentence 9.9.2.1.(2) states that fire escapes shall only be used as exits on existing buildings and shall be designed and installed in accordance with Subsection 3.4.7.

This provision is not a requirement. It expands the range of situations to where Subsection 3.4.7 applies. Therefore, one of the intent statements for Sentence 9.9.2.1.(2) is:

> **12** "***To expand the application of*** *Subsection 3.4.7. to include existing Part 9 buildings.*

Using Intent Statements

The intent statements may reinforce and may add to a Code user's existing knowledge.

Use of intent statements will be to verify the reasons for Code provisions. This may help achieve a common understanding and consistent application of the Code.

Summary

The key points of this appendix are:

- Intent statements will explain the reason(s) for each Division B provision.

- The standard phrases in every intent statement for a requirement will likely be:
  - "To limit the probability that…
  - "…which could lead to…"

- An intent statement will describe three types of reasons for a requirement:
  - an **initial consequence** the Code aims to limit,
  - a **chain of consequences** that could follow, and
  - a final **negative outcome** that is to be avoided.

- A Code provision may have more than one intent statement. Intents will be organized by objective in separate "windows" on the CD-ROM. Check all intent statements.

- Use of intent statements will be to verify the reasons for Code provisions. This may help achieve a common understanding and consistent application of the Code.

- **Intent statements will NOT form part of the enforceable Code. Like the appendices, they will provide additional information.**

Review

As a result of this appendix, I am able to:

☐ Describe the purpose of intent statements
☐ Recognize the wording and format of an intent statement

Appendix 5

EVALUATION

FACILITATOR / COURSE EVALUATION

The purpose of this questionnaire is to obtain feedback concerning Facilitators, courses and venues. This will help us improve our courses and maintain a high standard of facilitation and learning. **Your individual responses are CONFIDENTIAL. We ask that an individual be chosen by the class to package and seal in the Pre-Addressed/Self-Stamped envelope provided.** your confidential responses. That individual will then be responsible for personally mailing the envelope. **In order to provide relevant data, *PLEASE FILL IN ALL AREAS*.** Thank you for taking the time to fill out this evaluation. We appreciate your feedback.

Date of Course______________ Facilitator/Instructor Name:__________________________

Delivery Agent: ______________ Course Name: __________________________________

Present Occupation: __________ Course Location: ______________________________

Government ☐ Private ☐ *Code Related Experience* ☐*YES* ☐*NO*

1. ***How would you rate the following?*** (Select one box for each item.)

	Excellent	Good	Fair	Poor	Unsatisfactory
Facilitator/Instructor's knowledge of the subject	☐	☐	☐	☐	☐
Facilitator/Instructor's presentation of course material	☐	☐	☐	☐	☐
Helpfulness of Facilitator/Instructor	☐	☐	☐	☐	☐
Facilitator/Instructor's ability to control the discussion effectively	☐	☐	☐	☐	☐
Facilitator/Instructor's ability to hold your interest	☐	☐	☐	☐	☐
Facilitator/Instructor's ability to encourage class participation	☐	☐	☐	☐	☐
Overall how would you rate the Facilitator/Instructor	☐	☐	☐	☐	☐

2. ***What do you feel were the Facilitator/Instructor's strengths?*** (Please be specific)

____

____

____

3. ***In what ways might this Facilitator/Instructor improve?*** (Please be specific)

____

____

____

4. ***How would you rate the following*** (select one box for each item)

	Always	Usually	Sometimes	Never
Facilitator/Instructor uses a variety of training aids.	☐	☐	☐	☐
Facilitator/Instructor speaks in a clear and easy to understand manner.	☐	☐	☐	☐
Facilitator/Instructor demonstrates courtesy and respect for all students.	☐	☐	☐	☐
Facilitator/Instructor presents material at a comfortable speed.	☐	☐	☐	☐
Facilitator/Instructor starts class on time.	☐	☐	☐	☐

5. ***Course Content and Materials*** (select one box for each item)

	Always	Usually	Sometimes	Never
Was the course content organized in a way that you could understand?	☐	☐	☐	☐
Was the workbook easy to understand?	☐	☐	☐	☐
Did you find participation in the exercises beneficial?	☐	☐	☐	☐
Do you think that you will be able to apply what you have learned?	☐	☐	☐	☐
Did the course challenge you?	☐	☐	☐	☐

6. ***Overall, how would you rate the facilities where the course was delivered?***

Excellent	Good	Fair	Poor
☐	☐	☐	☐

7. ***Overall, how would you rate this course for information and format?***

Excellent	Good	Fair	Poor
☐	☐	☐	☐

8. ***Overall, how would you rate this course for usefulness to your profession?***

Excellent	Good	Fair	Poor
☐	☐	☐	☐

9. ***Overall, how would you rate this course?***

Excellent	Good	Fair	Poor
☐	☐	☐	☐

10. ***Additional Comments –***

Signature: (optional)

Appendix 6

CHARTS

New Location of Selected Familiar Provisions from 1997 Code					
1997 Code		**2006 Code**			
Part 1					
1.1.1.1.	Conformance with Administrative Requirements	Div. C,	1.1.1.1.	Conformance with Administrative Requirements
1.1.3.2.	Defined Terms	Div. A,	1.4.1.2.	Defined Terms
Part 2					
2.1.	Application (of Parts 1 to 11)	Div. A,	1.1.1.	Application of Division B
2.1.1.5.	Farm Buildings	Div. A,	1.3.1.2.	Farm Buildings
2.1.3.	Building Size Determination	Div. A,	1.1.3.	Building Size Determination
2.2.2.	BMEC Application Fees	Div C,	2.3.1.1.(1)	BMEC Application Fees
2.3.	Design and General Review	Div. C,	1.2.	Design and General Review
Table 2.6.3.2.	Referenced Documents	Div. B,	Table 1.3.1.2.	Referenced Documents
2.16.	Qualifications for Chief Building Officials and Inspectors	Div. C,	3.1.	Qualifications for Chief Building Officials and Inspectors
Parts 3 to 11		**Division B, Parts 3 to 12**		
Part 12		Division C, Part 4		

Ontario's 2006 Objective-Based Building Code

Top-Level Category of Objectives

OS	Safety
OH	Health
OA	Accessibility
OP	Fire, Structural, Water and Sewage Protection of Buildings
OR	Resource Conservation
OE	Environmental Integrity
OC	Conservation of Buildings

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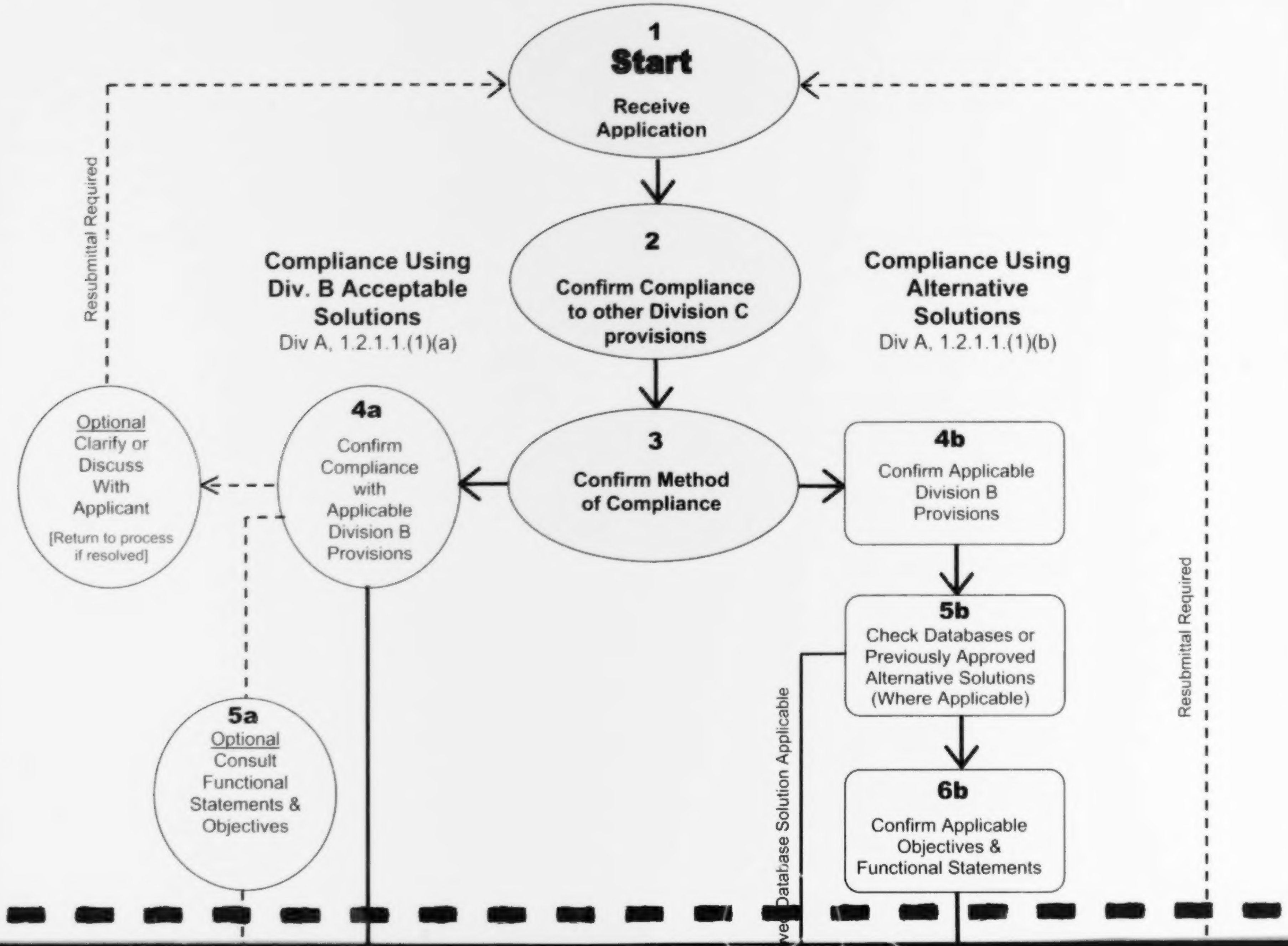
Applying the 2006 Code



1
Start
Receive Application

2
Confirm Compliance to other Division C provisions

Compliance Using Div. B Acceptable Solutions
Div A, 1.2.1.1.(1)(a)

Compliance Using Alternative Solutions
Div A, 1.2.1.1.(1)(b)

3
Confirm Method of Compliance

4a
Confirm Compliance with Applicable Division B Provisions

Optional
Clarify or Discuss With Applicant
[Return to process if resolved]

Resubmittal Required

5a
Optional
Consult Functional Statements & Objectives

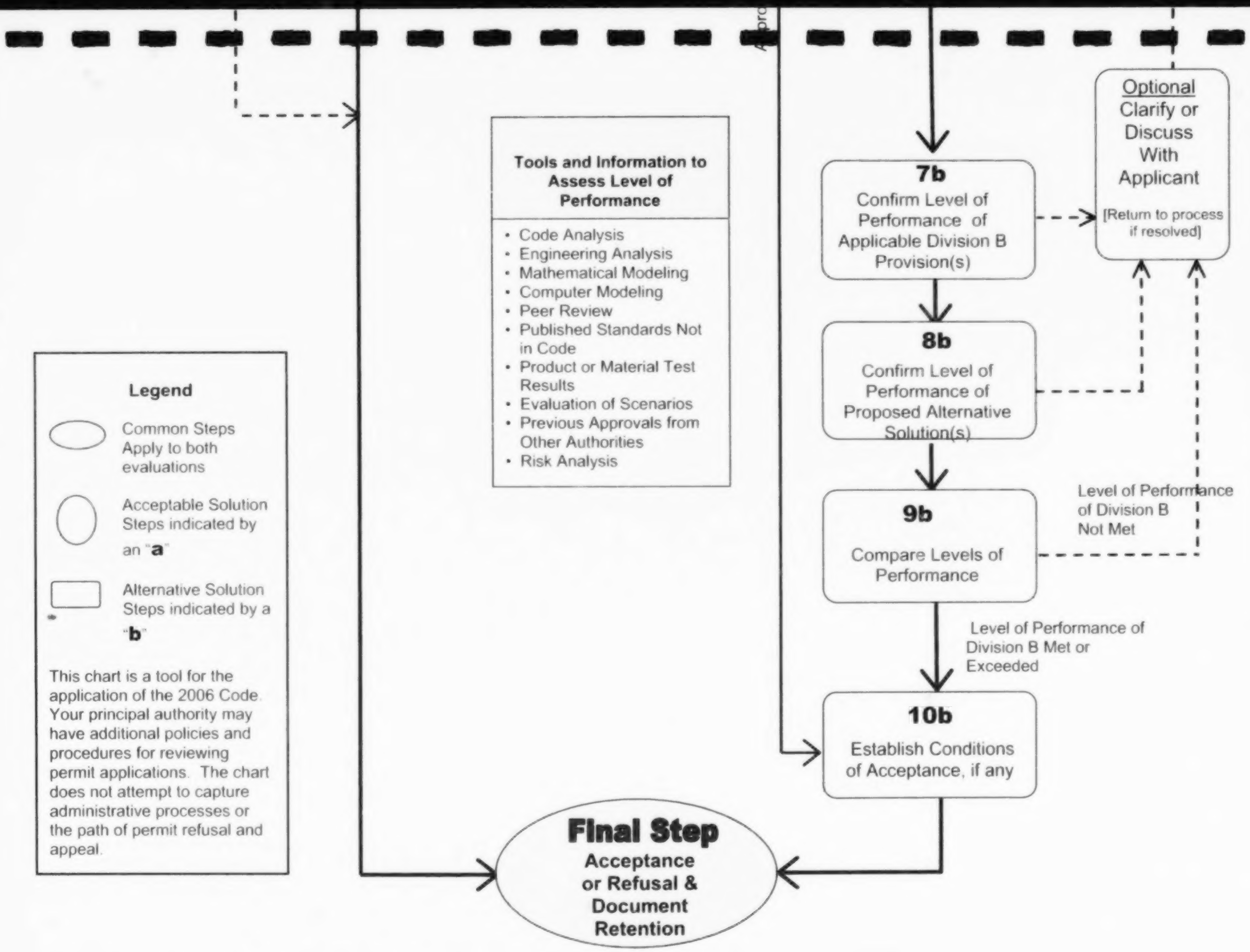
4b
Confirm Applicable Division B Provisions

5b
Check Databases or Previously Approved Alternative Solutions (Where Applicable)

6b
Confirm Applicable Objectives & Functional Statements

ved Database Solution Applicable

Resubmittal Required


7b
Confirm Level of Performance of Applicable Division B Provision(s)
Optional
Clarify or Discuss With Applicant
[Return to process if resolved]
8b
Confirm Level of Performance of Proposed Alternative Solution(s)
9b
Compare Levels of Performance
Level of Performance of Division B Not Met
Level of Performance of Division B Met or Exceeded
10b
Establish Conditions of Acceptance, if any
Final Step
Acceptance or Refusal & Document Retention

Tools and Information to Assess Level of Performance

- Code Analysis
- Engineering Analysis
- Mathematical Modeling
- Computer Modeling
- Peer Review
- Published Standards Not in Code
- Product or Material Test Results
- Evaluation of Scenarios
- Previous Approvals from Other Authorities
- Risk Analysis

Legend

⬭	Common Steps Apply to both evaluations
○	Acceptable Solution Steps indicated by an "**a**"
▭	Alternative Solution Steps indicated by a "**b**"

This chart is a tool for the application of the 2006 Code. Your principal authority may have additional policies and procedures for reviewing permit applications. The chart does not attempt to capture administrative processes or the path of permit refusal and appeal.

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Examples of Functional Statements

F02	To limit the severity and effects of fire or explosions.
F20	To support and withstand expected loads and forces.
F30	To minimize the risk of injury to persons as a result of tripping, slipping, falling, contact, drowning or collision.

Appendix 7

SELF-ADMINSTERED QUIZES

TRANSITION TRAINING FOR 2006 OBJECTIVE-BASED CODE

QUIZ

This quiz is intended to test your understanding of the new information and concepts in the 2006 Code.

The exam is multiple choice. Select the **best** answer by circling the corresponding letter. Answers may be found in the document placed after this quiz.

PART A (Modules 1 to 6)

1.	What are the top-level objectives of the 2006 Building Code? a) Safety, Health, Fire and Structural Protection of Buildings b) Health, Safety, Fire Protection of Buildings and Facilities, Energy Efficiency c) Safety, Health, Privacy, Convenience, Structural Protection d) Safety, Health, Accessibility, Fire, Structural, Water and Sewage Protection of Buildings, Resource Conservation, Environmental Integrity and Conservation of Buildings
2.	Is the 2006 Code a performance-based Code? a) Yes b) No
3.	In what Division of the 2006 Code can you find most of the technical provisions found in Parts 3 to 11 of the 1997 Code? a) Division A b) Division B c) Division C
4.	Who is responsible for proposing an alternative solution? a) Regulatory official b) Municipal council c) Designer/ Owner/ Owner's Agent d) Tenants

5.	In which Division would you find a Section titled "Qualifications for Designers"? a) Division A b) Division B c) Division C
6.	In which Division would you find the list of defined terms? a) Division A b) Division B c) Division C
7.	What is the INCORRECT way to reference Sentence 2.2.1.1.(1) from Division A? a) Division A, Sentence 2.2.1.1.(1) b) A – 2.2.1.1.(1) c) Division A, 2.2.1.1.(1) d) Div. A, 2.2.1.1.(1)
8.	What is the Code reference for the compliance options in Ontario's 2006 Objective-Based Codes? a) Division A, Sentence 3.2.1.1.(1) b) Division B, Sentence 1.2.1.1.(1) c) Division C, Sentence 1.2.1.1.(1) d) Division A, Sentence 1.2.1.1.(1)
9.	If a technical change occurred to the provisions dealing with minimum height of guards, in what Division would the change be found? a) Division A b) Division B c) Division C d) Appendices

10. The attribution tables include references to the following information:

- a) Objectives and intent statements
- b) Intent and functional statements
- c) Objectives and functional statements
- d) The level of performance of the provision

Use the selections in a) to e) below to answer Questions 7 through 9.

a) To facilitate the timely movement of persons to a safe place in an emergency.

b) Compliance with this Code shall be achieved by (a) complying with the applicable acceptable solutions in Division B, or (b) by using alternative solutions that will achieve the level of performance required by the applicable acceptable solutions in respect of the objectives and functional statements attributed to the applicable acceptable solutions in Supplementary Standard SA-1.

c) To limit the probability of overcrowding, which could lead to delayed egress during emergency evacuation, which could lead to harm to persons.

d) An objective of this Code is to limit the probability that, as a result of the design or construction of the building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury.

e) The posting of permanent signs indicating the occupant load of a floor area or part thereof for which the area has been designed, when the occupant load is other than that determined from Table 3.1.17.1. This applies to buildings described in Sentence 1.1.2.2.(1).

11. Which of a) to e) is an objective?

a) b) c) d) e)

12. Which of a) to e) is a functional statement?

a) b) c) d) e)

13. Which of a) to e) is Sentence 1.2.1.1.(1) from Division A?

a) b) c) d) e)

14.	You receive a building permit application for a new retail store. There is no application for an alternative solution. What method of compliance can you assume? a) Compliance using an equivalency b) Compliance with acceptable solutions c) Compliance using alternative solutions d) Compliance with the technical provisions of Division A
15.	What Division tells you that Division B, Part 9 is applicable to buildings with a residential occupancy that are 3 storeys or less in building height and not more than 600 m^2 in building area? a) Division A b) Division B c) Division C d) Appendices
16.	You receive a building permit application for an addition to a house. Under the 1997 Code you would have reviewed the framing provisions in Section 9.23. In the 2006 Code, where will you find the framing provisions? a) Division C, Section 9.23. b) Division A, Section 9.23. c) Division B, Section 9.25. d) Division B, Section 9.23.

17. What is the correct order of steps in the suggested procedure to apply the 2006 Code to an application for a permit under subsection 8.-(1) of the Building Code Act?

a) Receive Application Conforming to Div. C, Clauses 1.3.1.3.(5)(a) to (e)
Confirm Compliance with other Division C provisions
Confirm Compliance with Applicable Division B Provisions
Consult Functional Statements & Objectives
Confirm Method of Compliance Under Div. A, 1.2.1.1.(1)
Acceptance or refusal and Document Retention

b) Receive Application Conforming to Div. C, Clauses 1.3.1.3.(5)(a) to (e)
Confirm Compliance with other Division C provisions
Confirm Method of Compliance Under Div. A, 1.2.1.1.(1)
Confirm Compliance with Applicable Division B Provisions
Consult Functional Statements & Objectives
Acceptance or refusal and Document Retention

c) Receive Application Conforming to Div. C, Clauses 1.3.1.3.(5)(a) to (e)
Confirm Compliance with Applicable Division B Provisions
Confirm Compliance with other Division C provisions
Confirm Method of Compliance Under Div. A, 1.2.1.1.(1)
Consult Functional Statements & Objectives
Acceptance or refusal and Document Retention

PART B – Modules 7 to 12

1. Objectives reflect the basic philosophy of the Codes which is to:

   a) reduce the risk of injury, illness or damage in buildings
   b) ensure persons are never injured in buildings
   c) lower the costs of building and maintaining facilities
   d) make the Codes easier to enforce

2. What phrase is always found in objectives?

   a) Which could lead to
   b) To limit the probability that
   c) To facilitate
   d) To eliminate

3. Objectives specify who or what is to be protected. Which of the following people or things does the Code NOT protect?

   a) The public
   b) The building
   c) A person in the building
   d) Building contents

4. A third level objective describes:

   a) who or what is to be protected
   b) the specific cause of the injury, illness, damage or impeded access
   c) the risks to be protected against
   d) when and where the objective is applicable

5. Why is there a gap in numbering of functional statements?

   a) Many functional statements were removed since the original list was developed
   b) There is a master list of functional statements and not all Codes use all functional statements
   c) More functional statements may be added in the future to fit in with groups of similar issues
   d) There are no gaps in the numbering system of functional statements

6. A functional statement:

a) describes the reasons for a Code provision
b) explains the application of a Code provision to particular situations
c) describes what must be accomplished for the objectives to be met
d) describes who or what is to be protected by the Code provision

7. What word is NEVER found in a functional statement?

a) resist
b) stop
c) maintain
d) limit

8. The attribution tables for Division B, Section 3.2 show the following attributions for Sentence 3.2.6.9.(1):

[F12, F06 - OS1.2, OS1.5] [F12, F06 - OP1.2]

The linked pairs of functional statements and objectives that need to be evaluated are:

a) [F21 – OS1.2]
[F60 – OS1.2]
[F21 – OS1.5]
[F60 – OS1.5]
[F21 – OP1.2]
[F60 – OP1.2]

b) [F12 – OS1.2]
[F06 – OS1.2]
[F12 – OS1.5]
[F06 – OS1.5]
[F12 – OP1.2]
[F06 – OP1.2]

c) [F12 – OS1.2]
[F06 – OS1.5]
[F12 – OP1.2]
[F06 – OP1.2]

d) [F12 – F06]
[OS1.2 – OS1.5]
[F12 – OP1.2]
[F06 – OP1.2]

9. A proposed alternative solution involves fire stops in concealed spaces. The applicable Division B provision is 9.10.16.1.(1) which requires firestops in concealed spaces. One of the functional statement and objective pairs that it is linked to is **[F03-OS1.2].**

> **F03** To retard the effects of fire on areas beyond its point of origin.
>
> **OS1.2 Safety - Fire Safety**
> *An objective of this Code is to limit the probability that, as a result of the design or construction of a building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to fire caused by fire or explosion impacting areas beyond its point of origin.*

How would you describe the "area of performance" in simple language?

The solution must:

a) slow fire spread so that people can safely and quickly evacuate.

b) retard the effects of fire on areas beyond its point of origin so to limit the probability that a person will be exposed to a risk of injury due to fire.

c) minimize the risk of accidental ignition so that people are not injured due to fire spread.

d) slow fire spread so that people are not injured due to fire spread.

10. What is NOT required to be submitted for a proposed alternative solution?

a) Information related to the person(s) taking responsibility for the design
b) Any special maintenance or operation requirements
c) Letters of support from tenants or neighbours
d) A Code Analysis with all elements as per Div. C, 2.1.1.1.

11. A Structural Engineer has submitted a complex alternative solution dealing with a foundation. What information would you request from the Engineer?

a) The name of the Engineer's client and a copy of the contract between them
b) The other jurisdictions the Engineer has worked in and contact names
c) References from the Engineer's former clients
d) The qualifications, experience and background of the Engineer

12. What is required to be submitted with an application for a proposed alternative solution under Division C?

a) A Code Analysis (documentation)
b) Copies of the relevant sections of the Code
c) Proof of acceptance from other jurisdictions
d) Evidence of past performance

13. Which information in the 2006 Code are you required to use in the evaluation of alternative solutions?

a) Functional statements
b) Objectives statements
c) Objectives and functional statements
d) Functional statements and intent statements

14. An alternative solution is proposed for a roofing material on a house. Division B offers many design options for roofing in Part 9 such as asphalt shingles, sheet metal roofing, handsplit roof shakes etc… The alternative solution must meet the:

a) level of performance of the least expensive roofing material
b) minimum level of performance of any of the design options in Division B
c) highest level of performance level of any of the design options in Division B
d) average level of performance from all of the design option in Division B*

15. How would you best describe the level of performance of the following Division B provision?

Sentence 3.3.1.9 (1): *The minimum width of a public corridor shall be 1100 mm.* [F10, F12 -)S3.7]

a) The level of performance is 1100 mm

b) The level of performance is "how well" an 1100 mm wide public corridor allows persons to move to a safe place during an emergency

c) The level of performance is "how well" an 1100 mm wide public corridor allows persons to move furniture to a safe place during an emergency

d) The level of performance cannot be determined because this is a prescriptive requirement

16. Division C requires that a code analysis be submitted by a person requesting the use of an alternative solution. The code analysis is required to:

a) be at least 10 pages long
b) describe the applicable Code provisions, their objectives and functional statements, and their level of performance compared to the level of performance of the alternative solution
c) describe how much money will be saved
d) prove that the alternative solution is better than what is required by the Code

17. The level of performance of a proposed ________________________ must meet or exceed the level of performance of the applicable ______________________ provisions. **NOTE:** Chose **one** of the choices below that best completes the statement above.

a) Acceptable solution, Division A
b) Acceptable solution, Division B
c) Alternative solution, Division A
d) Alternative solution, Division B

18. What new information is published in the Code to guide the evaluation of proposed alternative solutions.

a) Acceptable solutions
b) Supplementary Standards
c) Objectives and functional statements
d) Application statements

TRANSITION TRAINING FOR 2006 OBJECTIVE-BASED CODE

QUIZ - ANSWERS

PART A (Modules 1 to 6)

1.	What are the top-level objectives of the 2006 Building Code? a) Safety, Health, Fire and Structural Protection of Buildings b) Health, Safety, Fire Protection of Buildings and Facilities, Energy Efficiency c) Safety, Health, Privacy, Convenience, Structural Protection d) ___Safety, Health, Accessibility, Fire, Structural, Water and Sewage Protection of Buildings, Resource Conservation, Environmental Integrity and Conservation of Buildings___*
2.	Is the 2006 Code a performance-based Code? a) Yes b) ___No___*
3.	In what Division of the 2006 Code can you find most of the technical provisions found in Parts 3 to 11 of the 1997 Code? a) Division A b) ___Division B___* c) Division C
4.	Who is responsible for proposing an alternative solution? a) Regulatory official b) Municipal council c) ___Designer/ Owner/ Owner's Agent___* d) Tenants
5.	In which Division would you find a Section titled "Qualifications for Designers"? a) Division A b) Division B c) ___Division C___*

6.	In which Division would you find the list of defined terms? a) ***Division A**** b) Division B c) Division C
7.	What is the INCORRECT way to reference Sentence 2.2.1.1.(1) from Division A? a) Division A, Sentence 2.2.1.1.(1) b) ***A – 2.2.1.1.(1)**** c) Division A, 2.2.1.1.(1) d) Div. A, 2.2.1.1.(1)
8.	What is the Code reference for the compliance options in Ontario's 2006 Objective-Based Codes? a) Division A, Sentence 3.2.1.1.(1) b) Division B, Sentence 1.2.1.1.(1) c) Division C, Sentence 1.2.1.1.(1) d) ***Division A, Sentence 1.2.1.1.(1)****
9.	If a technical change occurred to the provisions dealing with minimum height of guards, in what Division would the change be found? a) Division A b) ***Division B**** c) Division C d) Appendices
10.	The attribution tables include references to the following information: a) Objectives and intent statements b) Intent and functional statements c) ***Objectives and functional statements**** d) The level of performance of the provision

Use the selections in a) to e) below to answer Questions 7 through 9.

a) To facilitate the timely movement of persons to a safe place in an emergency.

b) Compliance with this Code shall be achieved by (a) complying with the applicable acceptable solutions in Division B, or (b) by using alternative solutions that will achieve the level of performance required by the applicable acceptable solutions in respect of the objectives and functional statements attributed to the applicable acceptable solutions in Supplementary Standard SA-1.

c) To limit the probability of overcrowding, which could lead to delayed egress during emergency evacuation, which could lead to harm to persons.

d) An objective of this Code is to limit the probability that, as a result of the design or construction of the building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury.

e) The posting of permanent signs indicating the occupant load of a floor area or part thereof for which the area has been designed, when the occupant load is other than that determined from Table 3.1.17.1. This applies to buildings described in Sentence 1.1.2.2.(1).

11. Which of a) to e) is an objective?

a) b) c) ***d)*** e)

12. Which of a) to e) is a functional statement?

a) b) c) d) e)

13. Which of a) to e) is Sentence 1.2.1.1.(1) from Division A?

a) ***b)*** c) d) e)

14. You receive a building permit application for a new retail store. There is no application for an alternative solution. What method of compliance can you assume?

a) Compliance using an equivalency
b) ***Compliance with acceptable solutions****
c) Compliance using alternative solutions
d) Compliance with the technical provisions of Division A

15.	What Division tells you that Division B, Part 9 is applicable to buildings with a residential occupancy that are 3 storeys or less in building height and not more than 600 m^2 in building area? a) **_Division A_*** b) Division B c) Division C d) Appendices
16.	You receive a building permit application for an addition to a house. Under the 1997 Code you would have reviewed the framing provisions in Section 9.23. In the 2006 Code, where will you find the framing provisions? a) Division C, Section 9.23. b) Division A, Section 9.23. c) Division B, Section 9.25. d) **_Division B, Section 9.23._***

17. What is the correct order of steps in the suggested procedure to apply the 2006 Code to an application for a permit under subsection 8.-(1) of the Building Code Act?

a) Receive Application Conforming to Div. C, Clauses 1.3.1.3.(5)(a) to (e)
Confirm Compliance with other Division C provisions
Confirm Compliance with Applicable Division B Provisions
Consult Functional Statements & Objectives
Confirm Method of Compliance Under Div. A, 1.2.1.1.(1)
Acceptance or refusal and Document Retention

b) ***Receive Application Conforming to Div. C, Clauses 1.3.1.3.(5)(a) to (e)****
Confirm Compliance with other Division C provisions
Confirm Method of Compliance Under Div. A, 1.2.1.1.(1)
Confirm Compliance with Applicable Division B Provisions
Consult Functional Statements & Objectives
Acceptance or refusal and Document Retention

c) Receive Application Conforming to Div. C, Clauses 1.3.1.3.(5)(a) to (e)
Confirm Compliance with Applicable Division B Provisions
Confirm Compliance with other Division C provisions
Confirm Method of Compliance Under Div. A, 1.2.1.1.(1)
Consult Functional Statements & Objectives
Acceptance or refusal and Document Retention

PART B – Modules 7 to 12

1.	Objectives reflect the basic philosophy of the Codes which is to: a) ***reduce the risk of injury, illness or damage in buildings**** b) ensure persons are never injured in buildings c) lower the costs of building and maintaining facilities d) make the Codes easier to enforce
2.	What phrase is always found in objectives? a) Which could lead to b) ***To limit the probability that**** c) To facilitate d) To eliminate
3.	Objectives specify who or what is to be protected. Which of the following people or things does the Code NOT protect? a) The public b) The building c) A person in the building d) ***Building contents****
4.	A third level objective describes: a) who or what is to be protected b) ***the specific cause of the injury, illness, damage or impeded access**** c) the risks to be protected against d) when and where the objective is applicable
5.	Why is there a gap in numbering of functional statements? a) Many functional statements were removed since the original list was developed b) There is a master list of functional statements and not all Codes use all functional statements c) ***More functional statements may be added in the future to fit in with groups of similar issues*** d) There are no gaps in the numbering system of functional statements

6. A functional statement:

a) describes the reasons for a Code provision
b) explains the application of a Code provision to particular situations
c) ***describes what must be accomplished for the objectives to be met****
d) describes who or what is to be protected by the Code provision

7. What word is NEVER found in a functional statement?

a) resist
b) ***stop****
c) maintain
d) limit

8. The attribution tables for Division B, Section 3.2 show the following attributions for Sentence 3.2.6.9.(1):

[F12, F06 - OS1.2, OS1.5] [F12, F06 - OP1.2]

The linked pairs of functional statements and objectives that need to be evaluated are:

a) [F21 – OS1.2]
[F60 – OS1.2]
[F21 – OS1.5]
[F60 – OS1.5]
[F21 – OP1.2]
[F60 – OP1.2]

b) ***[F12 – OS1.2]***
[F06 – OS1.2]
[F12 – OS1.5]
[F06 – OS1.5]
[F12 – OP1.2]
[F06 – OP1.2]*

c) [F12 – OS1.2]
[F06 – OS1.5]
[F12 – OP1.2]
[F06 – OP1.2]

d) [F12 – F06]
[OS1.2 – OS1.5]
[F12 – OP1.2]
[F06 – OP1.2]

9. A proposed alternative solution involves fire stops in concealed spaces. The applicable Division B provision is 9.10.16.1.(1) which requires firestops in concealed spaces. One of the functional statement and objective pairs that it is linked to is **[F03-OS1.2].**

> **F03** To retard the effects of fire on areas beyond its point of origin.
>
> **OS1.2 Safety - Fire Safety**
> *An objective of this Code is to limit the probability that, as a result of the design or construction of a building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to fire caused by fire or explosion impacting areas beyond its point of origin.*

How would you describe the "area of performance" in simple language?

The solution must:

a) slow fire spread so that people can safely and quickly evacuate.

b) retard the effects of fire on areas beyond its point of origin so to limit the probability that a person will be exposed to a risk of injury due to fire.

c) minimize the risk of accidental ignition so that people are not injured due to fire spread.

d) slow fire spread so that people are not injured due to fire spread.*

10. What is NOT required to be submitted for a proposed alternative solution?

a) Information related to the person(s) taking responsibility for the design
b) Any special maintenance or operation requirements
c) ***Letters of support from tenants or neighbours****
d) A Code Analysis with all elements as per Div. C, 2.1.1.1.

11. A Structural Engineer has submitted a complex alternative solution dealing with a foundation. What information would you request from the Engineer?

a) The name of the Engineer's client and a copy of the contract between them
b) The other jurisdictions the Engineer has worked in and contact names
c) References from the Engineer's former clients
d) ***The qualifications, experience and background of the Engineer****

12.	What is required to be submitted with an application for a proposed alternative solution under Division C? a) ***A Code Analysis (documentation)**** b) Copies of the relevant sections of the Code c) Proof of acceptance from other jurisdictions d) Evidence of past performance
13.	Which information in the 2006 Code are you required to use in the evaluation of alternative solutions? a) Functional statements b) Objectives statements c) ***Objectives and functional statements**** d) Functional statements and intent statements
14.	An alternative solution is proposed for a roofing material on a house. Division B offers many design options for roofing in Part 9 such as asphalt shingles, sheet metal roofing, handsplit roof shakes etc... The alternative solution must meet the: a) level of performance of the least expensive roofing material b) ***minimum level of performance of any of the design options in Division B**** c) highest level of performance level of any of the design options in Division B d) average level of performance from all of the design option in Division B*
15.	How would you best describe the level of performance of the following Division B provision? Sentence 3.3.1.9 (1): *The minimum width of a public corridor shall be 1100 mm.* [F10, F12 -)S3.7] a) The level of performance is 1100 mm b) ***The level of performance is "how well" an 1100 mm wide public corridor allows persons to move to a safe place during an emergency**** c) The level of performance is "how well" an 1100 mm wide public corridor allows persons to move furniture to a safe place during an emergency d) The level of performance cannot be determined because this is a prescriptive requirement

16. Division C requires that a code analysis be submitted by a person requesting the use of an alternative solution. The code analysis is required to:

a) be at least 10 pages long
b) ***describe the applicable Code provisions, their objectives and functional statements, and their level of performance compared to the level of performance of the alternative solution*** *
c) describe how much money will be saved
d) prove that the alternative solution is better than what is required by the Code

17. The level of performance of a proposed ________________________ must meet or exceed the level of performance of the applicable ______________________ provisions. **NOTE:** Chose **one** of the choices below that best completes the statement above.

a) Acceptable solution, Division A
b) Acceptable solution, Division B
c) Alternative solution, Division A
d) ***Alternative solution, Division B*** *

18. What new information is published in the Code to guide the evaluation of proposed alternative solutions.

a) Acceptable solutions
b) Supplementary Standards
c) ***Objectives and functional statements*** *
d) Application statements

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